The Chicago Board of Trade Recyclables Exchange:

Evaluation of Trading Activity
&
Impacts on the Recycling Marketplace

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I. Executive Summary

The Chicago Board of Trade (CBOT) closed its Recyclables Exchange for trading of recovered materials at the end of 1999 after operating the Exchange on the Internet for more than three years. The CBOT originally launched the Exchange in October 1995 as an electronic bulletin board accessible via computer modem, switching it to the Internet in the fall of 1996.

The 1995 launch was the result of a three-year collaborative effort by a public/private consortium (the "Project Partners") comprised of the National Recycling Coalition's (NRC) Recycling Advisory Council (RAC), the CBOT, the Clean Washington Center (CWC), the New York State Office of Recycling Market Development (NYSORMD), and the US Environmental Protection Agency's (EPA) Office of Solid Waste (OSW). During the three years leading up to launch the Project Partners garnered interest and advice from municipal recycling coordinators, state market development officials, recycled-content product manufacturers, waste management companies, and intermediate processing firms. In the end, however, recovered material buyers and sellers did not support the Exchange with enough trading activity to justify its continuation.

In February 2000 the National Recycling Coalition (NRC) contracted with Sound Resource Management Group, Inc. (SRMG), a Seattle-based environmental research and consulting firm, to conduct a final evaluation of the Exchange and determine its impacts on the recycling marketplace, including development of other e-commerce sites for trading recovered materials. This summary and the following report detail the results of that evaluation.

A. CBOT Recyclables Exchange Performance

Figure ES-1, CBOT Exchange Members, Logins & Postings, shows three key indicators of Exchange activity over its more than four years of operation[1]:

- Number of registered members.
- Number of member logins to the Exchange per month via computer modem prior to fall 1996, and via the Internet from fall 1996 through the end of 1999.
- Number of postings on the Exchange to buy or sell recovered materials.

As indicated on the chart, after an initial growth phase for the original computer modem dial-up Exchange, membership stagnated and only began to grow again when the Exchange switched to the Internet. At that time membership fees dropped from $1,000 per year to a one-time registration charge of $10. Memberships stalled again later in 1998, but then grew throughout much of 1999 to reach 569 by the time the Exchange closed its doors. Trade facilitators hired by NRC and publicity at the NRC's fall conference were at least partially responsible for this 1999 membership growth phase. Still, at the Exchange's close nearly a third of registered members were on standby status due to missing or inaccurate credit card information.

[1] Operational and information recording differences between the computer modem dial-up-based and Internet-based Exchange resulted in some data not being comparable or available for all months of operation.

During the first few months after the Exchange's launch, members showed intense interest, dialing up and logging onto the Exchange at a high rate. Member login rates then dropped off sharply. Members typically logged on to the Internet-based Exchange in total less than 100 times in a month, despite the growth in registered members.

Figure ES-1

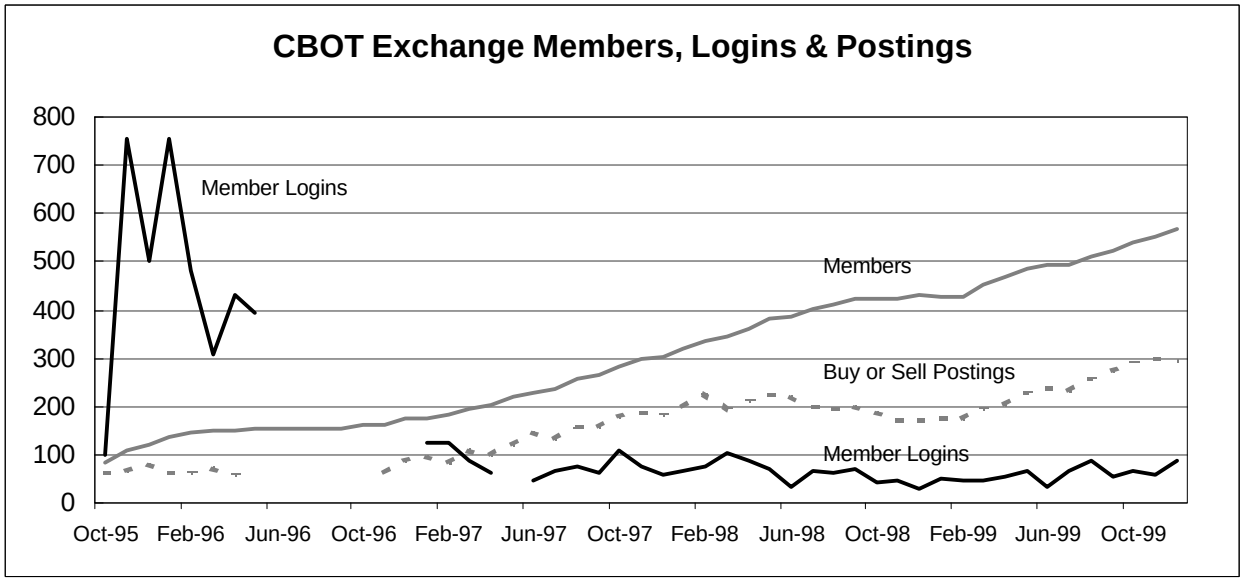


Figure ES-1 does show the expected association between membership growth and a third measure of Exchange activity -- postings to buy or sell materials. More importantly, an analysis of buy and sell listings for recovered paper, PET and HDPE in comparison with recycling market prices revealed some significant correlations. That is, market prices for old newspapers and mixed paper were positively correlated with buy listings for recovered paper, and negatively associated with sell listings. Similar relationships held for HDPE prices and listings. On the other hand, market prices for OCC and paper listings, and market prices for PET and recovered PET listings, were either less strongly or insignificantly correlated.

These results show that at least some postings by members were responsive to market trends. They also suggest that members attempted to use the Exchange more as a market for relatively less well-established recovered materials such as mixed paper, old newspapers, and HDPE bottles versus more-established materials such as cardboard and PET bottles.

The correlations between postings and price trends also indicate that members tended to use the Exchange as a market of last resort. When markets were tighter and prices higher, buyers tended to make postings on the Exchange hoping to find lower priced materials. When supply became plentiful relative to demand and prices moved down, sellers added listings to the Exchange searching for better deals, or any deal at all.

Unfortunately, movement in buy and sell postings in response to market trends did not lead to much deal making. Exchange members formally recorded only five trades with the CBOT. An-

ecdotal and interview data suggest that members executed a somewhat larger, but still insubstantial, number of non-recorded trades.

In addition, an examination of listings on the Exchange provided further evidence for the lack of actual trading. At the end of 1999, at least half of the sell listings for paper, plastics, glass, and rubber, as well as about half of the sell listings for materials in the miscellaneous category, had been posted in prior years. Offers to buy recovered materials on the Exchange appear similarly dated, although the lack of listing or modification dates made it difficult to precisely determine age for buy postings.

B. Impacts of the CBOT Recyclables Exchange on the Recycling Marketplace

The evaluation team's key findings regarding the Exchange's impacts on recycling market prices, recovered material quality and reliability, and market functionality are, as follows:

Recycling Market Prices

- Exchange transaction activity never achieved the volume necessary to affect recycling market prices, transaction costs, access or liquidity.
- Due to the lack of transaction activity, whether recorded or not, the Exchange never published any national or regional average price data for recovered materials, thereby limiting the value of the Exchange in providing market price trend information.

Recovered Material Quality and Reliability

- The Exchange engendered development and acceptance of specifications for crumb rubber and recovered plastic regrind and pellets.
- Project Partners' attempts to allow for greater material grade specificity in buy and sell postings got a mixed reception from Exchange users. However, grading detail developed for other e-commerce sites suggests that specificity in recovered material descriptions is critical for online trading.
- Project Partners' development of detailed material testing protocols, especially for glass and paper, was probably unnecessary for online trading; however, it did provide an option for resolving quality related disputes which would have remained largely unaddressed otherwise.

Recycling Market Functionality

- Publicity surrounding the Exchange's launch and operation helped improved recycling's public image, which could help increase demand for recycled-content products and thereby improve the breadth and depth of markets for recovered materials.
- Despite its failure to directly improve recycling market access and liquidity, the Exchange helped blaze the e-commerce trail by demonstrating through its errors the need to make trading fully functional online and to somehow verify and continually reinforce the commitment to online trading by participants.

C. Impacts of the CBOT Recyclables Exchange on E-Commerce

A number of other sites for trading recovered materials opened on the Internet during and after the period of time in which the CBOT operated the Recyclables Exchange. This naturally raises the question as to what influence the Exchange may have had on these other e-commerce sites. This is a difficult question to answer definitively, but a review of twenty-nine sites did provide some clues as to possible influences.

Nine of the sites reviewed provide information or services directly or indirectly useful to buyers and sellers of recovered materials, but do not actually offer materials trading. Two of the sites are in their pre-launch phase. Table ES-1 -- Trading Functionality, Price Discovery, and Specifications for Recovered Materials E-Commerce Sites -- characterizes seventeen sites on the Internet, including the CBOT Exchange, that trade in recovered or reusable materials and one site that trades in financial derivatives for recovered materials rather than the physical materials themselves.

Table ES-1
Trading Functionality, Price Discovery, and Specifications for Recovered Materials E-Commerce Sites

Website Address	Trading Functionality				Price Discovery		Detailed Specifications		
	Bulletin Board	Auction	Online Exchange	Market Maker/ Broker	View List	Real Time	Online Transactions	ISRI Grades	Other
aluminium.com			x		x	x	yes		x
cbot-recycle.com	x				x		no	x	x
ciwmb.ca.gov/calmax	x				x		no		
ebay.com		x				x	yes		
efibre.com		x				x	yes		x
EnronOnline.com				x	x	x	no	x	
fibermarket.com			x		x	x	yes	x	
fmp.plasticsmarkets.com	x						no		
j-src.com				x			no	x	
metrokc.gov/hazwaste/imex	x				x		no		
PaperExchange.com		x	x		x	x	yes	x	x
recycle.net/recycle	x				x		no		x
ScrapSite.net	x	x	x		x		yes	x	
sec-mat.com	x			x	x		no		x
sefex.com				x[1]	x		no	x	
thefiberexchange.com		x	x		x	x	yes	x	x
tnrcc.state.tx.us/exec/oppr/renew	x				x		no		
wastemanagement.com/recycle				x			no		

[1]Online listing of buy and sell offers suspended December 1999.

Like the CBOT Exchange, five of the other sites shown in Table ES-1 facilitate trading for the most part mainly by allowing members to post buy or sell offers. Users of these passive bulletin

board sites must peruse listings, make contact and negotiate a trade offline. Five sites provide more active facilitation through online auctions. Five sites, including three of the auction sites, are online exchanges, in the sense that they provide online mechanisms, other than auctions, for buyers and sellers to negotiate terms of a trade while they are online. These seven auction and/or online exchange sites also are the only sites on which buyers and sellers can actually consummate a deal while online. Finally, five of the sites are active market makers through trading in materials on their own account and/or brokering trading between third party buyers and sellers.

All but one of the sites on which members can conclude transactions online also offer real time price discovery. The exception is a new site with too few listings for the evaluation team to be able to verify the existence of real time price reporting. With the exception of two brokerages and one bulletin board that provide no actual offer or transaction price information, all the remaining sites at least offer price discovery through information provided on listings by buyers and sellers. As was the case with the CBOT Exchange, listings do not provide specific pricing when that information is omitted by the member posting a buy or sell listing.

All but one of the seven sites facilitating online transactions provide detailed specifications for each type and grade of recovered material that members can offer to buy or sell. The seventh site eBay is listed in Table ES-1 because it deals in reusable items. Reusable items offered at auction by eBay members typically include pictures and a detailed description of the item's condition. But eBay makes no attempt to provide grading definitions and specifications for items auctioned on its site.

Four of the bulletin board sites also make no attempt to provide detailed material specifications for items offered for trade through their sites. In this respect, the CBOT Exchange was somewhat unique as an electronic bulletin board site that provided extensive material grading categories for members who wished to use that detail in their buy or sell listings. Given the attention to specifications and quality assurance on e-commerce sites facilitating online trading, the Project Partners' emphasis on developing detailed specifications was well advised. It unfortunately was tied in to a trading format that did not actually need detailed online specifications because transactions were negotiated and concluded offline. In addition, the availability of extensive material grading categories may have discouraged use of the Exchange by those who believed they had to provide full detail in order to post a buy or sell listing.

Based on this summary of e-commerce site characteristics, as well as the evaluation team's review of site activity, it seems fair to conclude that the CBOT Exchange demonstrated the electronic bulletin board format with offline negotiations and transactions is a dead end for trading most recovered materials. Because it kicks buyers and sellers back to the phone and fax to complete trades, the bulletin board fails to fully exploit the potential of e-commerce. Online brokerages add the broker into the buyer-seller mix as a third party motivated to make a deal. But the currently operating brokerage sites do not fully exploit e-commerce's potential either.

By contrast online auctions and exchanges allow members to negotiate and close deals online. Some of these sites also include or plan to add the complexity of transacting over time, thus opening a significant new dimension of e-commerce functionality that draws even more substan-

tially on the data management and complex communication capabilities of computer systems connected through the Internet.

It is also interesting to note that with the exception of eBay, which is unique among the sites included in Table ES-1 in its trading of post consumer reusables, the auction and online exchange sites all focus on a single category of recovered materials, either paper or metals. This is in stark contrast to the multi-material sites such as the CBOT Exchange. The single material sites, which generally offer virgin materials and/or finished products along with recovered materials, might be characterized as closed loop markets for closed loop recycling. These sites are bringing large-scale brokers and end users into online trading, the type of market participant whose lack of interest in the CBOT Exchange doomed that venture.

Yet segregation of trading by closed loop end use industry may hold back development in markets for materials such as plastics or rubber. Trading in recovered materials that lack closed loop end use markets cannot piggyback with online trading in finished products or virgin materials as recovered paper or metals do on some auction and online exchange sites.

At the same time, piggybacking with finished products or virgin materials may be the only way for online trading in recovered materials to be economically viable. The amount of spot market trading in any single type of recovered material may be too small to support an e-commerce site focused just on trading a single material type. This is especially the case in recovered paper where long-term contracting has come into widespread use as a way to hedge against the risks of extreme market price cycles such as occurred during 1994-96.

A multi-material format for online trading that might prove viable would involve a site owner willing to broker, as well buy and sell on their own account, a wide variety of recovered materials. One site listed in Table ES-1 offers these services but conducts negotiations and closes transactions offline. Another site that has not yet launched claims that it will provide instant online transacting capability for recyclers, manage material transportation, and provide payment. Whether this site will offer a significant alternative to the single material sites remains an open question.

Finally, for sites wanting to create an online trading market in recovered materials the Exchange's demise demonstrated the need for active oversight on listing and trading activity, expiration dates on listings, and member screening for commitment to online trading through some means other than high membership fees. Too many out of date listings and too many "Looky-Lous" bog down a site's ability to service interested traders, thereby inhibiting the development of that critical level of trading activity needed to provide a liquid market and meaningful pricing information.

D. The Opinions of CBOT Recyclables Exchange Members and Non-Users

In general, the perspectives of Exchange members and of staff who worked for the organizations that developed the Exchange were quite similar regarding what they wanted in the recycling marketplace:

- Market liquidity for recovered materials.
- Accurate, up-to-date information on recovered materials prices.
- Manageable risk with respect to price, recovered material quality and fulfillment of transaction terms.

The ability of e-commerce to offer improvements where traditional recycling marketplace practices fall short in responding to these needs remains to be proven. The CBOT Exchange's passive electronic bulletin board format with offline trading certainly was not the answer. Based on interview data gathered by the evaluation team, some recycling industry organizations and businesses that chose not to use the Exchange believed that problems such as slow, inadequate or inaccessible markets and inconsistent material quality could not be solved by e-commerce. At the same time, Exchange users and non-users alike acknowledged that their lack of experience with computers and the Internet was a barrier to their use of e-commerce, especially during the early years of the Exchange's operation.

Based on interview data that the evaluation team gathered and/or reviewed, buyers and sellers alike were well aware of shortcomings in the recycling marketplace. Suppliers, processors, brokers and end-use manufacturers all wanted the transaction process to be more efficient. All wanted increased market liquidity and price transparency, as long as material quality and purchaser payments could be assured and economic viability of individual businesses not compromised.

More particularly, manufacturers of recycled-content products wanted a guaranteed supply of guaranteed quality recovered materials flowing into their production facilities so as to minimize their need to maintain large inventories. Recyclers and processors and suppliers wanted to get top dollar for their recovered materials whenever they were ready to market materials. Brokers wanted to be able to find suppliers on short notice when they needed to consolidate supplies from several sellers to fulfill a large purchase order, or have quick access to purchasers when they had a shipment from a large seller. Both buyers and sellers wanted clarity in specifications for material quality so that manufacturers would not be surprised when the recovered materials arrived at their production facilities, and processors would have a clear understanding of the quality standards to which they must adhere. To meet these needs, many buyers and sellers entered, and continue to enter, into long-term contracts. Such contracts, in turn, reduce the amount of spot market activity required to maintain the flow of materials from recyclers to end-users.

Another difficulty for an e-commerce solution to recycling marketplace problems is that trading recovered materials is different than trading stocks or auctioning reusable goods one at a time. Recovered materials are physical goods collected from a particular group of waste generators in a particular geographic location. Unlike transactions in stock certificates, distance between seller

and buyer matters for trading recovered materials. Unlike transactions in reusables, material quality cannot be readily assured with a picture, age, and brand name. However, the posting of information by members on previous transactions with buyers or sellers as is done on eBay may offer a means of material quality assurance or credit worthiness that is less cumbersome than after-the-fact arbitration involving quality testing procedures.

It is possible that e-commerce will not improve recycling markets in any substantial way. Instead Internet supported trading may simply supplement or replace the phone and fax with a computer connected to the Internet, while leaving recycling marketplace inadequacies largely uncorrected. CBOT Exchange users and non-users alike shared an awareness of this possibility. More likely, however, is the outcome in which recycling markets continue to mature and improve concomitantly with developments in e-commerce which use the potential of the computer and the Internet to more efficiently facilitate trading in recovered materials. The outcome of these mutually reinforcing developments should be more liquid markets connected to buyers and sellers through the Internet with a close to real time flow of current market pricing data.

II. CBOT Recyclables Exchange Background & Evaluation Project Methodology

The Chicago Board of Trade (CBOT) launched the Recyclables Exchange (Exchange) on October 17, 1995, accompanied by a flourish of media fanfare and an actual cash trade of 100 tons of recovered newspapers for $90 per ton from Oswego County in New York state, to Weyerhaeuser, a forest products company headquartered in Washington state. Many expected this $9,000 transaction to be the first in a rapidly growing series of transactions facilitated by the Exchange out of several billion dollars worth of recovered glass, paper and plastic marketed annually in the US.

Launch of the Exchange signaled a successful outcome to a three-year collaborative effort by a public/private consortium (often referred to as the "Project Partners" or the "Recycling Partnership") comprised of the National Recycling Coalition's (NRC) Recycling Advisory Council (RAC), the CBOT, the Clean Washington Center (CWC), the New York State Office of Recycling Market Development (NYSORMD), and the US Environmental Protection Agency's (EPA) Office of Solid Waste (OSW). During that three-year period, this consortium garnered interest and support from municipal recycling coordinators, state market development officials, recycled-content product manufacturers, waste management companies, and intermediate processing firms. Representatives from those sectors served on the steering committee and on working groups that helped to target materials for Exchange trading and to guide development of material quality specifications.

By one estimate, the consortium spent at least $750,000 developing the Exchange and promoting its launch. Most of this money covered outreach and promotion expenses, as well as programming costs for the Exchange's initial computer interface. About 20% of total spending went to develop specifications, third-party quality sampling and testing procedures, and arrangements for the American Arbitration Association (AAA) to train arbitrators who would provide dispute resolution for contested trades.

The Project Partners established the Exchange in its initial incarnation as a computer modem dial-up, electronic bulletin board system (EBBS) on which subscribing buyers and sellers of recovered materials could post their offers. All subscribers could scan these listings, using the Exchange's database query parameters, contact a buyer or seller, and attempt to negotiate a trade. The CBOT sold Exchange subscriptions for an annual fee of $1,000.

Project Partners set up the Exchange's buy and sell listings to provide information on material type, specifications and quality, quantity, location, and price. The Exchange offered buyers and sellers the opportunity to record their transactions and use Exchange-designated quality testing and/or arbitration procedures to resolve any disputes regarding a trade that could not be worked out by the trading parties themselves. The Partners expected recorded transactions to be of sufficient volume to be the basis for reliable average price information that the CBOT intended to provide to Exchange users.

In September 1996, the CBOT took down the EBBS and replaced it with an Internet site operated under contract to the CBOT by the Global Recycling Network (GRN). In an attempt to im-

prove the Exchange in response to user feedback, the CBOT redesigned the Internet-based Exchange to be more easily accessible and user friendly. A one-time $10 registration fee replaced the $1,000 annual subscription fee.

The CBOT also made other changes to the Exchange, including a new $2 monthly charge for each listing posted on the Internet-based Exchange by a seller. Furthermore, sellers could no longer directly contact a potential buyer upon seeing an interesting buyer's posting. Instead, after new postings by a buyer or a seller, the Exchange's computer system scanned sell listings against buy parameters, instantly e-mailing to a buyer a copy of any sell listing that matched that buyer's buy parameters. Each e-mail message contained contact information for the seller who had posted the matching sell listing. The buyer contacted the seller at the buyer's discretion. This change was made to provide the buyer with anonymity.

The Internet-based Exchange did not charge for a buy parameter posting, but each match cost the buyer $0.50. Users with more than 24 sell listings or 49 buy parameter matches, or more than 50 sell listings or 100 buy parameter matches, got volume discounts of 25% or 50%, respectively.

The Internet-based Exchange operated in this manner under contract to GRN for more than three years. The CBOT closed the Exchange on December 31, 1999, based on a determination by the CBOT and NRC that not enough trading was occurring to justify continued operation.

A. Evaluation Project Scope and Methodology

This report is the result of a project managed by NRC and conducted by Sound Resource Management Group, Inc. to evaluate the CBOT Recyclables Exchange system and determine the impact of the Exchange on the recycling marketplace, including the development of new e-commerce sites for trading recovered materials. NRC plans to use the results of previous NRC research and this evaluation project to make recommendations on how e-commerce can be adapted to meet the needs of the recycling industry.

The following task list for the Exchange evaluation summarizes the project's scope of work and methodology:

- Conduct confidential interviews with representatives from each of the Project Partner organizations to determine their objectives and perspectives, and summarize their comments in the final report.
- Assemble and review past research on implementation and use of the Exchange, and summarize this research in the final report.
- Interview a selected number of representatives from recycling industry organizations and businesses that chose never to use the Exchange to determine their perspectives, and summarize their comments in the final report.
- Review and summarize Exchange activity and trading information, both to measure trends in Exchange use over the course of its existence, and to evaluate the Exchange's impact on transactions costs and market access, recovered material quality and reliability, availability

and accuracy of price information, stability of recovered material prices, and e-commerce in the recycling marketplace.

- Gather and summarize relevant recycling marketplace price data for the period during which the Exchange operated and utilize this information in evaluating the Exchange's impact on market trends and conditions.
- Inventory and analyze recovered material specifications listed on the Exchange and determine adequacy of those specifications in facilitating electronic trading of recyclable commodities.
- Inventory and characterize other electronic commerce sites for trading recovered materials and analyze the potential for these sites to succeed at the objectives originally established for the CBOT Recyclables Exchange.
- Utilizing information gathered in the above tasks, assess market-wide impacts of the Exchange on the recycling marketplace and the use of electronic trading for recyclable commodities.

B. Evaluation Team

NRC contracted with Sound Resource Management Group, Inc. (SRMG), a solid waste management and recycling research and consulting firm founded in Seattle, WA in 1987, for the Exchange evaluation. SRMG personnel have worked for numerous clients on a wide variety of projects related to collecting, processing and marketing recyclables. Projects conducted by SRMG have included analyzing historical recycling market prices for the past two decades and preparing forecasts of those price levels, analyzing general market capacity and pricing trends and issues, and analyzing markets for specialty materials such as various grades of rubber processed from vehicle scrap tires.

Dr. Jeffrey Morris, an economist and statistician with fifteen years experience in tracking and analyzing solid waste management practices, costs, prices, markets and rates, was SRMG's lead investigator for the evaluation project. Morris was responsible for research on Exchange activity and trends, analyzing the Exchange's impacts on the recycling marketplace, inventorying e-commerce sites for trading recyclables, preparation of the final report, and overall project management of the consultant team. Susan Fife-Ferris, SRMG's legal and business recycling expert, assisted with the inventory of e-commerce sites.

Skumatz Economic Research Associates, Inc. (SERA), a certified women-owned business enterprise, subcontracted to SRMG on the evaluation team -- conducting interviews, reviewing some past research, and collaborating in evaluation of the Exchange's market-wide impacts. SERA specializes in conducting program evaluations and has nationally recognized expertise in evaluation techniques and gathering supporting interview data. Dr. Lisa Skumatz, an economist with more than 19 years of experience in economic and policy issues in solid waste and resource conservation, conducted Project Partner questionnaire development and interviews, and managed non-user questionnaire development and interviews by SERA staff associate John Green. Skumatz was also responsible for summarizing and tabulating data from these interviews.

A group of peer reviewers were also part of the Exchange evaluation team. The peer reviewers included:

- ***Steve Edelson***, Director of Materials Marketing for Non-Fiber Commodities for Waste Management, Inc., and creator of a country-wide centralized marketing system, enhanced electronically at <wastemanagement.com/recycle>,
- ***Jane Erkenswick***, Vice President and Owner, Recycling Services, Inc., and creator of the Paper Identification and Grading Workshop,
- ***Pete Grogan***, manager of Market Development for Weyerhaeuser Recycling,
- ***Joe Massey***, Massey Management Consultants,
- ***Jerry Powell***, editor-in-chief at *Resource Recycling*,
- ***Mike Schedler***, Director of Technical Affairs for the National Association for Plastic Container Recovery, and
- ***Mike Walsh***, Senior Vice President of Environmental Financial Products Limited, which specializes in providing customized risk management and trading services and developing new financial, commodity, and environmental markets.

C. Acknowledgements

This report is the result of time and effort on the part of many people:

- Numerous CBOT Recyclables Exchange users and non-users who gave of their time and wisdom in interviews and forums.
- Staff from the Project Partners organizations who participated in lengthy interviews by members of the evaluation team, promptly responded to phone calls and e-mails, and diligently reviewed one or more drafts of this report.
- Peer reviewers who spent significant amounts of time on the phone with the evaluation team and also diligently reviewed a draft of this report.
- SERA personnel who conducted interviews with Project Partner staff and with Exchange non-users and drafted several sections of this report.

Evaluation team members from SRMG offer our thanks to all who helped with this evaluation project. Without the participation of so many involved in the recycling industry this report would have been much less informative and insightful. Inaccuracies or faulty conclusions that still lurk within remain the responsibility of SRMG.

III. Project Partner Objectives & Perspectives

To determine objectives and perspectives of agencies and organizations involved in conceiving, designing, funding and operating the CBOT Recyclables Exchange, the evaluation team conducted confidential interviews lasting on average about an hour, but varying from 20 minutes to two hours, in February and March, 2000, with the following nine personnel who had worked for the indicated agencies/organizations on the Exchange project[2]:

- Bonnie Culp, CBOT
- Garrett Dolan, NYSORMD
- David Dougherty, CWC
- Henry Ferland, EPA
- Will Ferretti, NYSORMD
- Jim Gilbert, NYSORMD
- Edgar Miller, NRC
- Enrico Sala, GRN
- Mike Walsh, CBOT

Interview questions addressed a variety of issues, including:

1. Objectives for the Exchange and problems the agencies and organizations were trying to solve.
2. Roles of the agencies involved.
3. How the Exchange operated and operational changes over time.
4. Outreach and promotion methods for the Exchange.
5. Satisfaction with the Exchange, including its planning, operations, and impacts.
6. Strengths, weaknesses, and barriers.
7. Material specifications and quality testing procedures developed for the Exchange.
8. Impacts the Exchange had on the recycling marketplace.
9. Suggestions for ways to measure the Exchange's impacts.

A. Problems in Recycling Marketplace

The evaluation team asked what problems the Exchange would solve. The nine staff members from partnering agencies were in fairly strong agreement in responding to this question with twenty-six specific comments. The evaluation team grouped interviewees' comments into the following five categories of key problem areas in the recycling marketplace (number of comments referring to each problem area indicated in parentheses):

- Recycling marketplace inefficiencies, such as failure to match up buyers and sellers (12).
- Lack of information on recycling market prices (5).
- Lack of uniform material specifications (4).
- Lack of demand for recovered materials (3).
- Too much price volatility and risk (2).

[2] Dolan, Dougherty, Ferretti, Miller and Walsh are no longer affiliated with the Project Partner organizations indicated after their names.

B. Objectives for Recyclables Exchange

Staff from the public/private consortium agreed about their objectives for the Exchange. The evaluation team asked them to summarize their understanding of the program's objectives. Staff identified the following five goals in thirty-nine specific comments (number of comments referring to each goal noted in parentheses):

- Increase market efficiency - e.g., by expanding access, facilitating buyer-seller interaction, developing standardized contracts, or taking the initial steps toward creation of a futures market (16).
- Provide price and other data recordation for actual trades (10).
- Develop industry-wide specifications for recovered materials (8).
- Increase visibility and credibility of recovered materials as useful commodities (4).
- Make recycling more economically viable in the long run (1).

C. Roles for the Project Partners

The evaluation team asked Project Partner staff to describe the roles played by their own organization and the other partnering agencies. Table 1 lays out detailed responses. In general, interviewees agreed that:

- EPA provided most of the public funding and national government support.
- CBOT provided design and operational expertise, as well as major support for pre-launch marketing efforts.
- CWC provided early impetus for the project and took the lead in developing product specifications and product quality testing procedures.
- NYSORMD provided project administration and budgetary oversight, organized consensus building efforts through focus groups, and organized arbitration procedures to resolve trade disputes.
- NRC served as public policy lead, coordinated and promoted recycling industry participation, and eventually took over as project manager.
- GRN provided proprietary technology and operated the Internet-based Exchange under contract to CBOT.

Some changes in responsibility took place during the more than four years between Exchange launch and closure. When the lead staff person at NYSORMD moved to NRC, the latter organization became project manager. The initial lead staff person for CBOT took employment elsewhere shortly before the Exchange's launch. At some point responsibility at CBOT changed to the marketing department, CBOT technical input declined, and the CBOT brought in GRN to develop and run the Internet-based Exchange.

Table 1

Roles of Recycling Partner Agencies in Exchange Design and Operations

EPA	NYS
• Provided major funding and federal credibility • Maintained broad-based partnership for the project and kept parties involved • Hosted regular conference calls • Provided high level proponents for the system • Provided some neutral facilitation among Project Partners	• Provided Public sector role, as well as financial and staff leads in early phases • Worked on developing specifications for materials – held focus groups, coordinated industry meetings, and built consensus on specifications • Developed arbitration rules and network of arbitrators to mediate quality disputes between buyers and sellers and certify materials as needed
NRC	**CBOT**
• Served as project manager – received and disbursed grant funds, served as public policy liaison, and managed partner input • Developed/coordinated media communication strategy after the launch • Involved in early stakeholder meetings • Coordinated recycling industry input • Marketed the program, getting word out to recycling industry and NRC members • Prepared brochures and other outreach materials • Helped bring members and other potential users to workshops to learn about program • Coordinated and conducted user interviews	• Provided major role in development, marketing and pre-launch workshops • Developed/coordinated media communication strategy for the launch • Involved in early design / conceptualization – previously designed other "green" markets / exchanges • Led development of market for recyclable material and advocated for system designs • Set up original exchange system • Arranged meetings with industry, visited industry • Arranged for Internet system subcontractor to update / modify exchange system delivery, oversaw contract • Contributed internal funds and staff time
CWC	**GRN**
• Helped bring idea to other partners • Led development of testing standards with emphasis on implementable/enforceable terms • Established network of testing laboratories • Provided engineering and technical staff and high level facilitator role for early phases • Developed specifications and participated in focus groups for industry input and buy-in	• Provided proprietary technology and ran the Exchange on the Internet • Provided model based on another exchange GRN had established • Served as electronic host for system • Provided program and system maintenance

D. Promotion and Outreach

Project Partner staff recognized promotion and outreach as important for Exchange success. For example, when Project Partners sought funding from US EPA's Environmental Technologies Initiative, the proposal included an aggressive marketing campaign, focused on recruiting buyers and sellers and publicizing the Exchange's potential benefits. The partnering agencies used a wide array of techniques to publicize the Exchange:

Press and Marketing: Media coverage of the Exchange's launch was extensive. Senior personnel at EPA and other federal government agencies got involved in the launch through me-

dia comments and/or attendance. CBOT and NRC issued press releases. New York State put the word out to all the municipalities in that state, and NRC notified its members about the program and launch. Partner staff placed articles in magazines and trade journals, and used direct mail, including mailings to membership lists that NRC assembled from state recycling organizations. NRC also highlighted the exchange in its own publications.

Workshops: Project Partner personnel conducted fourteen pre- and post-launch workshops over a 6-month period, with approximately 1,000 attendees. NRC picked the venues and helped promote the workshops. CBOT and CWC personnel helped explain the program and features. The workshops targeted recycling industry players, as well as an array of other potential users.

Conferences: Partnering agencies marketed the Exchange at a number of conferences both before and after launch. This included promotions and/or presentations at MWMA, SWANA, and NRC conferences, as well as specific industry conference presentations by CBOT. In response to questions about how potential traders could find out about the Exchange and what worked and did not work in promoting the Exchange, Project Partner staff provided the following comments:

- Workshops worked; they were targeted and well-attended.
- Workshops were better then direct mail; advertising in trade journals did not appear to generate much response.
- Industry conferences were strong components in the outreach strategy; industry-by-industry approach seemed to provide good targeting and appeared to be successful.
- Some of the early outreach probably was too technical for municipal audiences who may have needed more handholding.

E. Satisfaction with Recyclables Exchange

The evaluation team asked Project Partner staff to rank on a scale of 1 to 5 their satisfaction with various phases and aspects of the Exchange's development, operation and results. Table 2 displays averages and ranges for their responses.

As shown in Table 2, planning, staff skills, and professionalism received high scores. The lowest scores were all related to number of trades. The ranges show that some Project Partners disagreed widely regarding delivery of service, timeliness in service delivery to customers, and range of services. Those scoring timeliness low noted that postings would occur, but then the listing sat, waiting for a match. They did not perceive this to be very practical for people looking to buy or sell materials.

Project Partners gave the Internet-based Exchange lower scores than the EBBS. The two key rationales for this difference were:

- Marketing was less aggressive than during the launch phase.
- Users, especially sellers, had to “wait passively” for trading opportunities.

In response to a question about their perceptions of the Exchange participants' degree of satisfaction, four gave no opinion and five gave scores of 1 or 2. The five Project Partners who gave these low scores said that participants must have been quite dissatisfied because so few were using the Exchange.

Table 2
Satisfaction with the CBOT Recyclables Exchange

	Score (1=very unsatisfied; 5 =very satisfied)	
Exchange Characteristics/Issues	**Average**	**Range**
Planning	4.25	4 - 5
Skills of Staff	3.92	3 - 5
Professionalism in Appearance	3.75	2 - 4.5
EBBS Exchange Design	3.50	2 - 5
Range of Services Offered	3.20	1 - 4.5
Ease of Use	3.00	2 - 4
Outreach Materials	2.83	2 - 4
Marketing Efforts/Approach	2.67	1 - 4
Service Delivery to the Customer	2.60	1 - 4
Timeliness of Service Delivery	2.55	1 - 5
Internet Exchange Design	1.92	1 - 3
Impacts on Recycling Marketplace	1.78	1 - 3.5
Number and Quality of Trades	1.33	1 - 2
Number of Trades vs. Potential	1.00	1 - 1

F. Recyclables Exchange Strengths and Weaknesses

When the evaluation team asked staff of the Recycling Partnership agencies to list the Exchange's major strengths and weaknesses, staff personnel mentioned a total of 21 strengths and 33 weaknesses. Strengths included (frequency of mention listed in parentheses):

- Pioneered efforts to move beyond traditional ways of doing business, make recycling markets more efficient, and bring attention to the need for better price information (6).
- Made progress on developing uniform material specifications (5).
- Elevated perception of recyclables from "garbage" to commodities (4).
- Involved respected, big name partners in a successful public/private consortium (3).
- Got players in the recycling industry to talk together (1).
- Helped teach municipalities about the art of selling recovered materials (1).

Respondents mentioned about 50% more weaknesses than strengths, and there was less agreement about important issues. Several believed strongly that the Internet-based Exchange suffered from lack of personal handholding and facilitation, which they felt was key particularly because the Exchange was an early user of the Internet and most recyclables traders were relatively unsophisticated in electronic commerce. Staff also mentioned the Exchange's design as an important

weakness – especially the lack of dialog capabilities – because it eliminated the ability to complete trades on line. Weaknesses mentioned more than once included:

- Difficulty in breaking away from historical practice of personal-relationship-based, one-to-one trading (4).
- No real commitment by large buyers/sellers or by industry associations, which could have "blessed" the Exchange and motivated trading (4).
- Lack of a human element to facilitate trades (3).
- Inability to negotiate or dialog and inability to complete trades on-line (3).
- Overly detailed outreach information (2).
- Inability to get systematic price information (2).
- Lack of user sophistication (2).
- Lack of immediacy -- sellers could not wait for matches to yield results (2).
- Inability to track individual deals or gather data on completed transactions (2).

Partnering agency personnel also listed a number of programmatic weaknesses just once:

- Claims that some municipal sector sellers were not getting fair prices for their recyclables alienated brokers.
- The recycling community had too little awareness of the Exchange.
- The Exchange did not achieve most of its goals in addressing significant marketplace challenges.
- The membership fee was too high at first.
- More follow-up was required when the Exchange switched to the Internet.
- The Exchange never launched futures markets.
- Exchange members did not use third party verification.
- Trades and their value were not recorded and captured.
- Project Partners closed the Exchange.

Project Partner responses to a question about marketplace barriers to the Exchange paralleled stated program weaknesses. Staff noted that business practices and structures -- such as relationship-based trading, vertical integration of some major players, and entrenched self-interest in keeping prices confidential to protect profit margins -- limited the Exchange's potential. Several also mentioned difficulties caused by introducing electronic trading techniques just when e-commerce options were changing dramatically and recycling industry players were for the most part still not computer savvy.

In addition, partnering agency staff mentioned other barriers to the Exchange's success. Namely:

- The CBOT eventually withdrew marketing and financial support.
- The initial fee was too high.
- Too few listings on the Exchange led to too few trades which led to fewer listings and so on, setting in motion a vicious cycle.
- The Exchange developed procedures for testing material quality that were too costly relative to the actual market value of recovered materials.

- Tax subsidies on virgin materials keep virgin prices low and thereby limited trading of recyclables on the Exchange.

The evaluation team asked Project Partner staff a follow-on question -- did they have suggestions for changes if the Exchange were to be revived and/or to guide other e-commerce efforts? Out of 42 total responses, staff most frequently mentioned the following modifications or enhancements:

- Increase marketing coupled with a buy-in and commitment from related industry associations and larger buyers/sellers (10).
- Increase customer service through facilitators to help trades, garner interest, and spur use (7).
- Provide additional services such as the ability to dialog, negotiate and complete trades on line, or the ability for users to report their experiences with purchasers or sellers (5).
- Provide capacity to see/capture actual transaction prices (4).
- Simplify and revise specifications to get them adopted in the recycling marketplace (3).
- Link with other sites to share information or form a super trading forum that could publish prices and take small fees or commissions to support itself (3).
- Restrict trading to just one or two materials and get those going before attempting to handle additional materials (2).
- Consider leapfrogging to a futures market or establishing a standard contract (2).

G. Product Specifications

The partnering agencies believed that an important determinant of the Exchange's success would be the existence of well-understood definitions of what “product” was being traded. Otherwise, buyers and sellers would be unable to talk about price and negotiate a trade, and the Exchange would not be able to broadcast information about prices. Project Partners invested significant effort in attempting to define material specifications and develop testing procedures that would enable buyers and sellers to come to agreement on what they were trading without having to actually inspect the material in person.

Project Partner staff mentioned that the aspects of this process that worked particularly well, at least for some materials, were the involvement of industry and the group consensus building that occurred. Industry contributed staff time and funding to attend meetings, including attendance and time commitments from senior people. Some partners felt that this emphasis on standards, testing, and quality is one thing that distinguished the CBOT recyclables exchange from other networks.

Some staff raised concerns about the Exchange's product specifications and mentioned their hope that there would be follow-on work to keep the standards evolving to keep up with current recycling marketplace practices. Others noted that some related follow-on work was still proceeding as part of an attempt to develop a paper price index via a project being managed by NRC.

H. Recyclables Exchange Impacts

The evaluation team asked Project Partners for their assessment of the impact of the Exchange on the recycling marketplace. Virtually all interviewees agreed that quantitative impacts from the

Exchange were relatively small – and 6 of the 48 comments elicited in response to this question stated this specifically. However, all respondents noted general but important impacts they believed that the Exchange had brought to the marketplace. These general impacts included (number of mentions listed in parentheses):

- Increased acceptance/awareness/visibility of recyclables as valuable commodities, not garbage, and recycling as an important business activity (12).
- Addressed, discussed, and established uniform standards for a number of important products (8).
- Opened the door for other e-commerce efforts in recycling (7).
- Highlighted the need for price disclosure (4).
- Created some standards that might help spawn futures markets (2).
- Established public markets for recyclables (2).

I. Tracking Recyclables Exchange Impacts

Finally, the evaluation team asked Interviewees for suggestions on data or information that might be gathered to measure the Exchange's impacts on the recycling marketplace. The Exchange did not generate data on actual trade quantities and prices. Despite this lack of customary indicators for economic activity, Project Partner staff listed 36 responses to this inquiry. Those suggestions mentioned most often included (with number of mentions shown in parentheses):

- Counts of Exchange activity, such as web site hits, sell/buy listings by category and over time, members, participants, matches, recorded trades, usage rates, or deals consummated (14).
- Number of follow-on e-commerce sites, assuming CBOT as catalyst (4).
- Surveys of users (3).
- Changes in level of recycling industry awareness (3).

Interviewees provided singular mentions of other intriguing possibilities:

- Number of times industry players (e.g., paper brokers) use the CBOT name.
- Number of times a seller was put into direct contact with a buyer.
- Documenting what is happening in the marketplace regarding load rejections and dispute resolution.
- Number of times current trades are completed using CBOT Exchange definitions and specifications.

IV. Subscribers/Registered Users and Guest Users -- What They Did

The CBOT Recyclables Exchange operated for a year as a dial-up EBBS system, and for just over three years on the Internet. Figure 1 shows that after an initial growth phase, membership subscriptions to the EBBS quickly stagnated at just over 150 by April 1996, six months after the October 1995 launch. This included 49 initial complimentary subscriptions for organizations and businesses that participated in trial runs and tests prior to launch.

Membership began to grow again in the fall of 1996 when CBOT switched the Exchange to the Internet, replaced the $1,000 annual subscription fee with a one-time $10 registration fee, and along with other Project Partners promoted the Exchange at NRC's annual conference. Membership on the Exchange continued to grow moderately throughout the following three years, totaling 569 registered users by December 1999. Of that total, however, 182 were on standby status, due to missing or bad credit card information, while 387 were actively billable via credit card.[3] The number of Exchange members in good standing increased more strongly during 1999, mainly due to new registrations which averaged 16 per month during the last half of 1999, peaking at 22 in December.

Figure 1

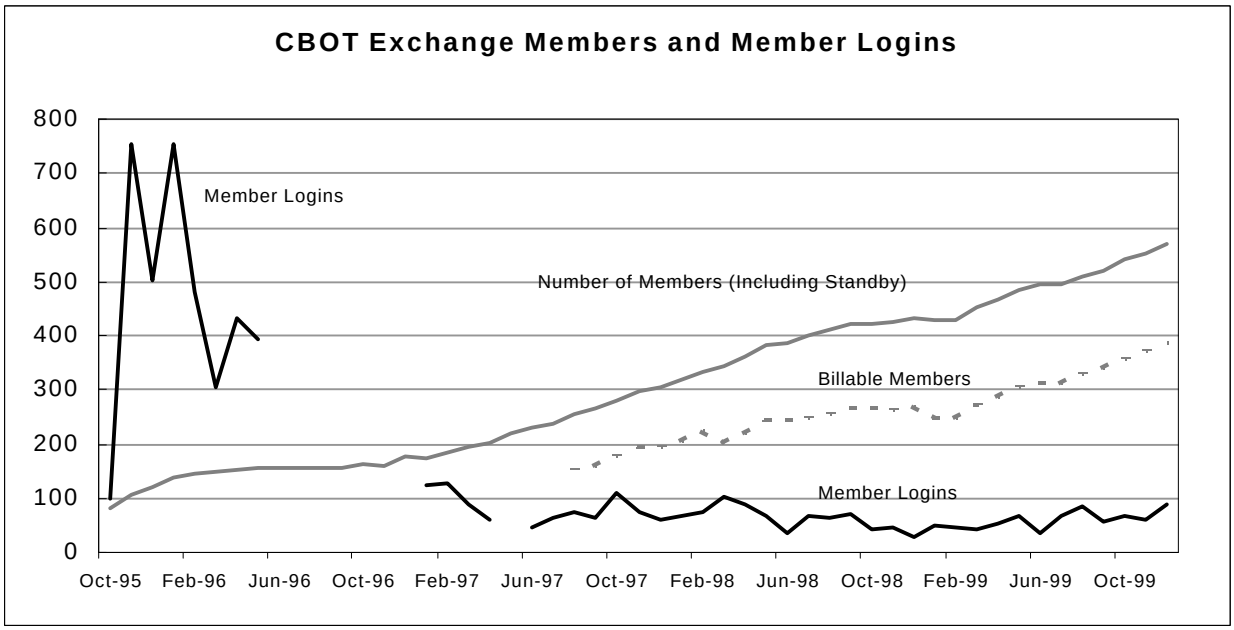


Figure 1 also shows one measure of Exchange activity -- number of logins by members (subscribers/registered users) over the course of each month. The chart clearly shows a high level of login activity per subscriber during the few months following launch of the dial-up Exchange. But interest, as manifested in member logins, quickly died out. Even conversion to the Internet

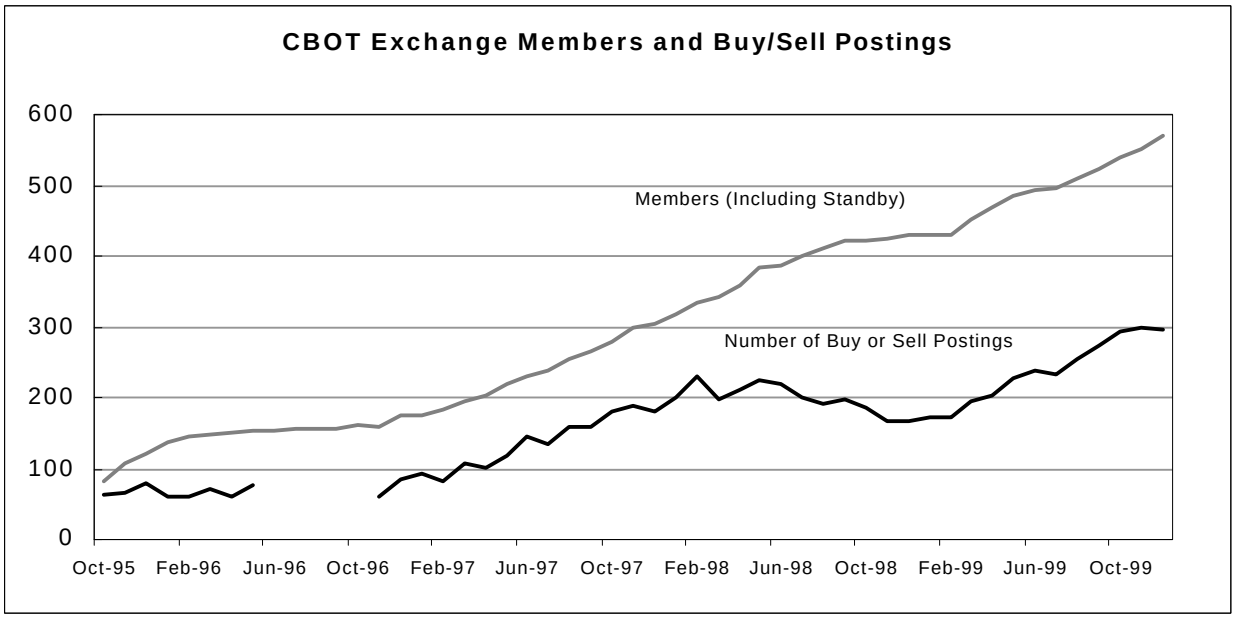
[3] Operational and information recording differences between the EBBS-based and Internet-based Exchanges resulted in some data series, such as active versus standby member counts, not being comparable or available for both systems. Also, data for certain series are missing and not available for certain months or periods of months.

and the dramatic drop in membership fees beginning September 1996 did not rekindle interest in any substantial amount.

Counting visits or visitors provides a second measure of activity on the Exchange. This activity measure takes into account guest and potential member use and interest, in addition to member use. Consistent information on daily or monthly visits and visitors is not available for charting a trend line. Nevertheless, one can determine that monthly visits ranged between 500 and 1,500 during the initial half-year of operation as an EBBS system. After the switch to the Internet, visits ranged between 2,100 and 3,000 per month throughout 1997, then fell back slightly into the 2,000 to 3,000 range in 1998. In 1999 monthly visits increased into the 2,500 to 3,500 range, attaining the upper level in March, October and November. The NRC's employment of two trade facilitators during the last half of 1999, as well as publicity and promotion at NRC's fall conference that year, helped pushed Exchange activity into these higher levels.

A third measure of Exchange activity consists of the number of postings by members to buy or sell recovered materials. Figure 2 shows number of Exchange members compared with the combined number of buy and sell postings at month end for October 1995 through December 1999. After the initial postings at Exchange launch, the number of buy and sell listings settled down at about one for every two members. Listings per member (including both active and standby members) remained at this level until almost a year after conversion to the Internet. Then listings per member rose to a 20% higher level mid-1997 through mid-1998, fell to a 20% lower level late 1998 through mid-1999, and returned to the one listing per two members level for the last six months of Exchange operations.

Figure 2



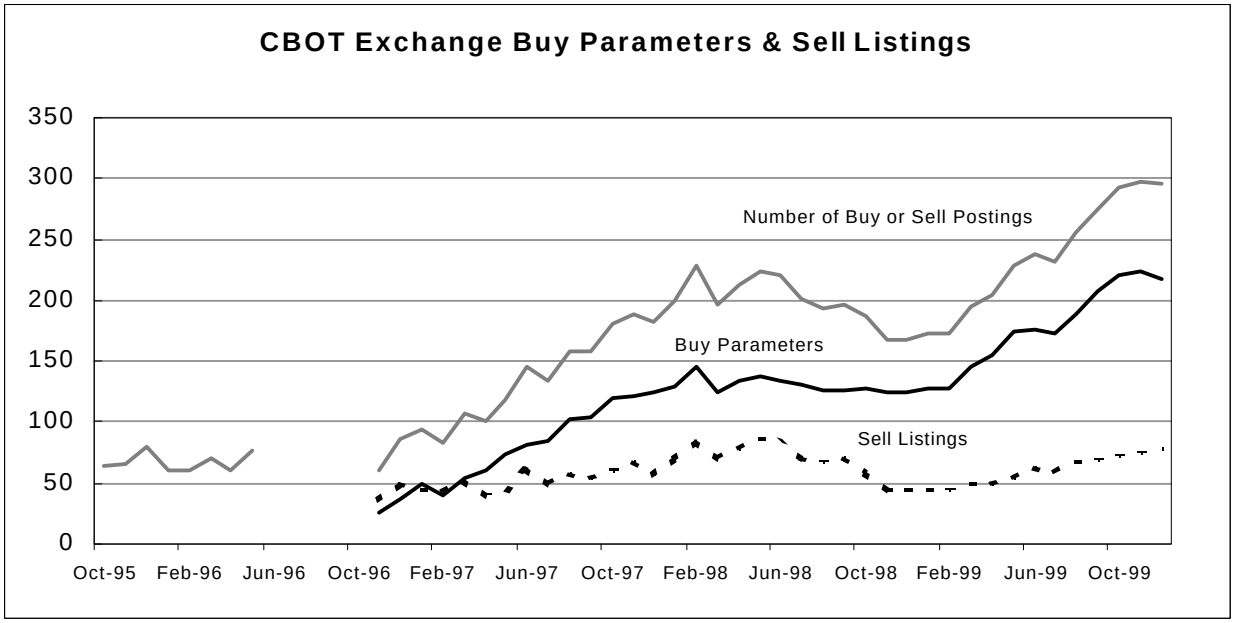
Excluding standby members from this calculation does indicate that conversion to the Internet and low-cost membership boosted listings up to an average of one for each active member. By the end of 1999 the listings per active member ratio still remained 60% above the ratio attained

under the EBBS and $1,000 subscription fee system. However, it was not possible to determine how many of these listings contained information that was all current at any given month end.

Separate data on buy versus sell listings are not available for Exchange EBBS operations. However, CBOT and GRN did track buy and sell listings separately for the Internet Exchange. Figure 3 shows trends on the Internet-based Exchange for buy and sell postings. As indicated on the chart, both buy and sell postings trended upward during the year and a half after the Exchange converted to Internet access. Member postings of buy parameters then dropped off and leveled out for about a year, while sell listings moved down somewhat. During 1999, postings of buy parameters picked up significantly, as overall recycling markets improved and the NRC brought in trade facilitators to motivate Exchange activity. Sell listings also trended up, but less steeply.

There was no monthly charge for buy parameters, nor did the Exchange have any procedure for making sure that listings were up to date. Perhaps as a result, some members posted buy parameters that they never changed.

Figure 3



One might have expected the $2 per month charge for sell listings to keep those postings more current. Perusal of sell listings on the Exchange at December 31, 1999, however, revealed that 50% of sell listings for paper and plastics had been posted prior to the beginning of 1999. The only sell listing for glass was posted in 1997. Seven of nine sell listings for tires, tire chips or crumb rubber were posted prior to 1999. Almost 50% of sell listings in the miscellaneous category were also posted prior to 1999.[4]

[4] One of NRC's trade facilitators carried out member interviews. The facilitator's contact attempts during the late summer and fall of 1999 resulted in the following conclusion regarding current viability of buy and sell listings: "Most listings in both the buy and sell categories were not current. Several went back to 1997 and had not been revised. Approximately 30% of the listings had been added to or modified in 1999. Both buyers and sellers seemed unaware of the need to update information regularly in order to 'refresh' the system and create new matches." (Cen-

Based on the existence of so many out-of-date listings it is somewhat difficult to sort out whether currently viable buy or sell postings were actually increasing over time as one might conclude from the data shown on Figures 2 and 3. As discussed later in this report in Chapter VII, The Exchange and the Recycling Marketplace, buy and sell listings for some recovered materials did tend to move in synch with fluctuations in recycling market prices. Thus, despite the dead weight from out-of-date listings, some members apparently were updating old listings and/or posting new listings on a regular basis. Still, in relation to the multitude of transactions in recovered materials that occur throughout the US each month, the number of listings on the Exchange, whether including out-of-date listings or not, never rose above an inconsequential level.

Figure 4 provides a fourth measure of Exchange activity - matches delivered. Figure 4 compares buy parameters and sell listings with number of matches delivered to buyers in each month from November 1996 through December 1999.

Once the Exchange moved to the Internet, sellers were no longer able to peruse buy postings or contact buyers directly, as they had been able to do for a time on the EBBS-based Exchange. Instead, the Exchange's website computer system reacted to any new or modified posting by scanning for sell listings that would match buy parameter postings (material type, quantity, quality, location and price). The computer system then automatically notified buyers by e-mail of new matches. A buyer had the option of contacting the member with the matching sell listing to try and arrange a trade. Sellers were not informed of matches at all, and would only find out that a match with their sell listing had occurred if the matched buyer contacted them.

As indicated on Figure 4, there is no discernible trend in number of matches delivered while the Exchange was operating via the Internet. Trade recordation was voluntary on the Exchange. Members only ever recorded five trades. These recordations all occurred during the initial months of Exchange operation. For this reason it is not possible to determine whether some or any of the matches delivered on the Internet-based Exchange ever resulted in a completed transaction.

At least two of the prominent spikes in matches delivered probably were unrelated to real or potential trading opportunities. The largest ever spike of 217 matches happened in May of 1999 and is mostly the result of a single new user. This new user logged on and registered on May 13, entered a sell listing that same day, and inserted 8 buy parameters and 2 sell listings the next day. That next day, May 14, this user received notification of 146 matches in the miscellaneous commodity category. Similarly, the report by one of NRC's trade facilitators documents that the July 1999 spike was caused by a new user mistakenly posting a sell listing when they had meant to post a buy parameter.[5]

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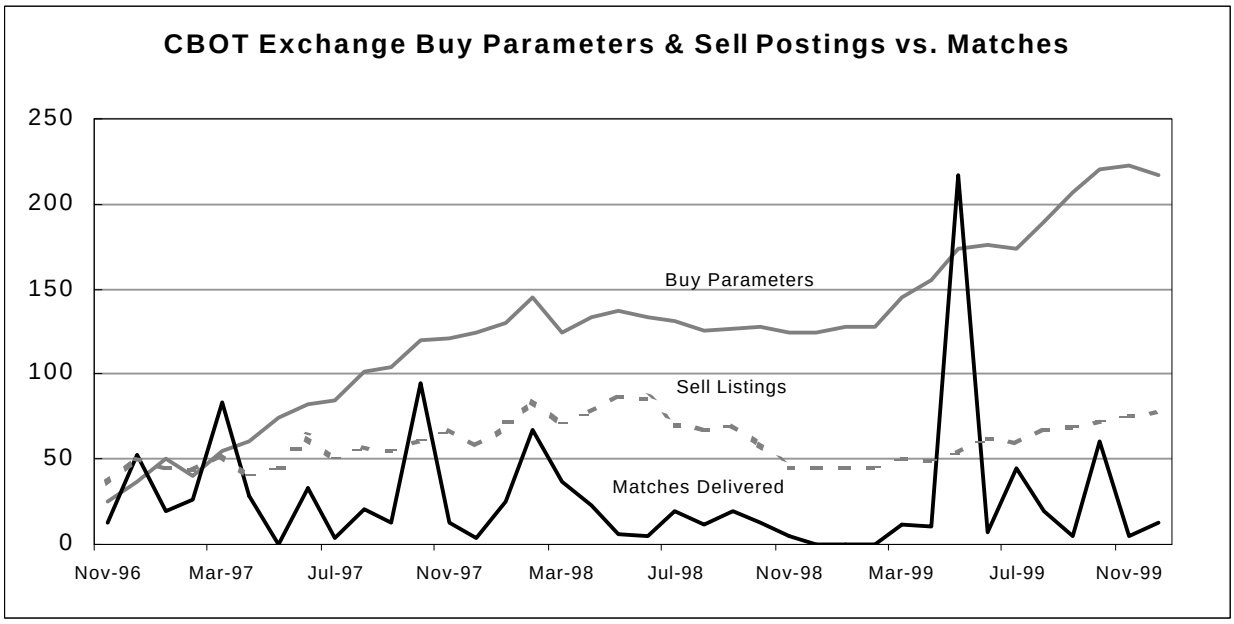
ter for Solid Waste Research, *Project Report: Trade Facilitation Research for Chicago Board of Trade Recyclable Exchange*, prepared for the National Recycling Coalition, December 15, 1999, page 2.)

[5] Center for Solid Waste Research, *op. cit*., page 3.

Finally, Figure 4 indicates that there is virtually no correlation between matches delivered and either the number of buy parameters or sell listings.[6] Had buy and/or sell postings caused matches that resulted in trades, one would have expected to see some correlation between number of matches delivered and number of buy or sell postings on the Exchange during the same time period. For example, an upward trend in buy parameters should have been associated with an up trend in matches delivered, other factors remaining constant. Or, as a second example, a significant spike in matches delivered that resulted in completed trades would likely be associated with a subsequent decrease in number of sell listings when sellers deleted the marketed materials from their listings on the Exchange.

Figure 4



[6] In fact the correlation coefficient between number of sell listings posted at month end and number of matches delivered during the month is .02, and correlation between number of buy parameters and matches is .05. Both correlation coefficients are statistically not significantly different from zero.

V. Registered Members and Guest Users -- What They Said

Project Partners devoted substantial time and funds gathering feedback from members and guests who used or at least logged on to the Exchange. Specifically, Project Partners conducted five significant formal efforts to gather feedback at various times throughout the years of Exchange operations.

1. NYSORMD held subscriber and guest user focus groups in New York and Chicago in February 1996, with eight and ten attendees at the New York and Chicago subscriber focus groups, respectively, and seven and three attendees at the New York and Chicago guest user focus groups, respectively.
2. NRC staff surveyed over 60 subscribers to the EBBS-based Exchange in the summer of 1996.
3. A staff member at NYSORMD conducted seven in-depth interviews with subscribers during the year that the Exchange operated as an EBBS.[7]
4. NRC surveyed about 25 registrants on the Internet-based Exchange in the spring and summer of 1998.
5. One of NRC's trade facilitators conducted a phone survey of 65 registrants (25 of whom had posted sell listings and 40 of whom had posted buy parameters), as well as an e-mail survey of 400 registrants on the Internet-based Exchange which garnered 44 returned surveys during the fall of 1999.

A. 1996 EBBS-Exchange Focus Groups

NYSORMD conducted four focus groups in early February 1996 to gather feedback on the then three-and-a-half month old EBBS Exchange. Project Partners held focus groups in Chicago and New York City, one for subscribers and one for guest users in each city. CBOT and/or NYSORMD personnel videotaped and observed all four focus groups from behind one-way mirrors. NYSORMD staff informed focus group participants of the videotaping at the beginning of the sessions.

Ten subscribers (3 recycler/processors, 1 large-scale hauler/processor, 2 plastics re-processors, 1 large-scale glass beneficiator, 2 paper brokers, and 1 plastic commodities broker) and three guest users (1 paper recycler/processor, 1 public sector owner of a MRF operated by a private contractor, and 1 plastics end user and re-seller), respectively, attended the subscriber and guest user focus groups in Chicago. Eight subscribers (2 textile recyclers, 1 large-scale MRF operator and broker, 1 marketing representative for a MRF, 2 plastics processors and end users, 1 wood end user, and 1 crumb rubber producer and plastics end user), and seven guest users (4 paper recyclers/processors, 2 paper brokers, and 1 tire/rubber recycler) attended the respective focus groups the next week in New York.

Focus group question and answer sessions tended to last about two hours. A NYSORMD staff member posed discussion questions, typically by calling on each attendee in turn to give their response. There was also a good deal of give and take among attendees on some topics.

[7] These seven in-depth interviews are included in that staff member's doctoral dissertation, J. Garrett Dolan, *The Recyclables Marketplace: A Transaction Cost Economics Approach*, Dissertation submitted in partial fulfillment for the degree of Doctor of Social Science, Syracuse University, 1998.

Questions or categories of questions that NYSORMD staff asked of subscribers and guest users, and their responses, included:

1. How would you (subscribers or guest users) describe the CBOT Recyclables Exchange?
In answer to this question subscribers focused on the Exchange as an on-line system to list materials and find buyers or sellers, a method for public price discovery and tracking of recycling markets, and a method for networking with listed members. Guest users focused on the Exchange as an EBBS and/or commodities market.

2. What features/services does the Exchange provide and to what extent do you (subscribers) use each of them?
All seven New York subscribers mentioned that they always used the bid/offer screens. Five said they always looked at pricing and specifications information on comparable materials. Chicago subscribers reported similar importance for the bid/offer screens and ability to compare prices and specifications. Both groups mentioned and reported some use of the e-mail messaging function, as well as noting and using the information on system users and user activity. Subscribers also mentioned using a variety of other features such as trade recordation or report screens. But they used these features much less frequently.

3. What is your (subscribers) opinion of the listed bids and offers? Are there enough to be of value? Are they realistic? Is enough information provided?
Many of the Chicago and New York subscribers felt strongly that there were not enough listings and that too many of the listings had unrealistic pricing. The glass beneficiator said he had posted attractive buy and sell offers and received no response. A textile recycler had previously been a stockbroker and said that the large spread between bid and offer prices for some materials indicated that those prices were a bit out of whack and that some subscribers were trying to hit "home runs". Some subscribers also had difficulty paging/switching between screens and printing information from the screens.

NYSORMD staff asked guest users similar questions about the summary screens of bids and offers. Their responses were less critical, and several felt the pricing information was useful, especially for plastics. However, several also mentioned that there was no way to tell whether a listed bid or offer was still open or had been closed but not yet removed from the system.

4. How many (subscribers) have posted a bid or offer and what are your reasons for posting or not posting?
All ten Chicago subscriber focus group attendees had posted, while just half of the New York subscriber attendees had. The search for new and/or more diverse markets motivated many subscribers to post on the Exchange, with several of the New York subscribers especially noting that they posted mainly oddball or one time special materials. Several Chicago subscribers also mentioned posting in order to see if they could do better than with their existing markets.

5. What needs to be done to get people like yourselves (subscribers) to list more bids/offers?
Many subscribers mentioned that financial incentives, trial memberships, discounts from the $1,000 membership fee, and/or more advertising were some possibilities for getting more subscribers. At least one subscriber also mentioned the threat of direct transactions between recy-

clers/processors and end use mills, thus cutting out the broker middleman, as a reason why the brokerage community was, by and large, anti-CBOT.

In terms of getting existing subscribers to post more bids/offers, attendees noted that the lack of end users on the Exchange, especially the large-scale manufacturers of recycled-content products, was a significant barrier. Here again subscribers also mentioned that the Exchange's computer interface needed to be more user friendly

Nine of the ten Chicago subscribers had contacted a subscriber who posted a bid or offer they found on the Exchange, and four had concluded deals from Exchange postings. Three of the eight New York subscribers had contacted an Exchange subscriber regarding a bid or offer, but none had concluded a deal from the Exchange.

6. What are the reasons product/quality description screens are not being used more often?
Only about 15% of subscriber focus group attendees have ever filled out some portion or all of the product/quality screens available on the EBBS Exchange. Subscribers' reasons for their lack of use of the product/quality screens included that it was too time consuming, too complicated, key attributes are missing (for plastics), more commodity product definitions are needed (for rubber), and some of the attributes included are not of value for paper grades.

However, the most important reasons appeared to be the customary practice of worrying about quality after deciding whether to pursue a trade with a given player, and the widespread acceptance and understanding of standard grades for many materials, such as ONP (old newspapers), OCC (old corrugated cardboard), ledger, CPO (computer print out), and bales of PET (polyethylene terephthalate) pop bottles. Also of importance was the belief that for some materials -- e.g., residential mixed paper -- quality is so diverse that no list of attributes could ever nail it down enough to eliminate in-person inspection. To avoid problems caused by users not filling out the information on the product/quality screens, several subscribers suggested simplifying the product descriptions down to a few attributes (such as ISRI grade), all included on the one summary screen, and requiring users to fill in all information for these "standard" attributes.

7. Why are trades not being recorded?
Only one of the eighteen subscribers had recorded a transaction, despite the fact that four had concluded deals from the Exchange. Reasons for this included that the recordation process was too time consuming or too cumbersome (e.g., counter party failing to mail back the form prevents recordation), it seemed pointless ("If I know who I'm dealing with we can work out any quality issues. If I don't know who I'm dealing with, I'm not going to do business with them."), and the belief that it locked traders into using the dispute resolution service.

Subscribers suggested remedies that included unbundling transaction price reporting and use of dispute resolution procedures, linking user ability to post new bids to their recordation of previous trades, or providing a financial incentive to record trades.

8. What benefits do you (subscribers and guest users) derive from using the Exchange?
New York subscribers for the most part stated that price information and development of increased or new markets were the most important benefits they derived from the Exchange. Most Chicago subscribers also ranked price discovery and market development opportunities as most

important. Other benefits of high importance to more than one or two subscribers included information about market activity trends, networking opportunities, and increased credibility/legitimacy for recycling. One subscriber was fairly adamant about the Exchange's importance in potentially eliminating brokerage fees, estimated by one attendee at $5 per ton brokered.

Guest users mentioned pricing information and marketing leads as significant benefits they derive from their use of the Exchange.

9. What benefits are you not getting that you expected to get?
Subscribers complained that the number of buyers is too low, the large-scale players are notably absent, and the number of sellers is too low for glass. As a result, the activity/listing/transaction levels on the Exchange are far below what they expected. This feeling was echoed by guest users. Both types of user missed seeing transaction price information. Some guest users apparently also had expectations that they would get information on specifications and on users posting bids and offers that was more akin to the level of detail that subscribers can access.

10. What would you (subscribers) like to change about the Exchange? What will influence you (subscribers) to renew or not renew? What will it take to get you (guest users) to subscribe?
Subscribers wanted to make the Exchange easier and less costly to use, for example, by switching to a Windows-based system on the Internet. They also wanted to simplify some of the product/quality attributes, provide more information about other users and eliminate the ability to post anonymous listings, expand number and involvement of international subscribers and markets, and offer more value and more advertising of that value to get large buyers involved.

Almost all subscribers said they would renew. But they also indicated that the number of bids/offers and transactions needs to go up, the amount of profitable use they get from their membership needs to increase, bigger players need to be posting bids, and the computer system needs to get easier to use.

Guest users stated that the initial fee of $1,000 was a substantial barrier to subscribing. Also, guest users indicated that the number of listings and guest access to data both need to increase to provide sufficient information and motivation to subscribe.

11. What do you (subscribers and guest users) look for when deciding whether or not to do business with a buyer or seller?
Both subscribers and guest users indicated that ability to pay and pay on time, reputation for delivering a quality product, reliability in terms of being able to provide repeat business, and ability to offer a competitive price are the most important characteristics for a trading partner.

12. How do you (subscribers and guest users) determine that the price you pay or receive is a fair price or reflective of the "going market" price?
Subscribers and guest users both network with trusted trading partners, review periodicals and trade journals, and call around for other bids or offers to make sure that they are getting fair prices. Some also mentioned looking at prices for competing virgin materials and keeping an eye on general economic trends as other types of information that they find useful in judging their bids and offers.

B. 1996 EBBS-Exchange Subscriber Phone Survey

During the summer of 1996, NRC conducted a phone survey of over 60 subscribers to the EBBS-based Exchange. The survey's purpose was to learn how subscribers are using the system, why they are or are not using certain features of the Exchange, whether the system is meeting their expectations, and if they have ideas for how the Project Partners can improve and/or increase use of the system. Additionally, NRC used the phone calls to encourage subscribers to more actively participate on the Exchange and to answer questions subscribers had about the system.

64% of respondents were mainly involved in selling materials, 16% in buying, and 20% in both buying and selling (e.g., as brokers). Key materials handled by survey respondents were (number handling that type of material shown in parentheses):

- Plastics (30)
- Paper (24)
- Curbside materials mix or similar mixes (9)
- Many or various materials including metals, fibers, rubber, glass, automobiles, and textiles (1 or 2 each)

Over 90%, spread across all interviewee types and all materials, of respondents reported that they were currently using the exchange to buy or sell materials.

1. Experience with the Exchange

Respondents got involved with the CBOT Recyclables exchange for the following reasons (number of mentions for each reason shown in parentheses):

- Buy and/or sell materials (24).
- Check prices (14).
- Track/monitor the market or market trends (13).
- Look for new contacts or buyers (3).
- See how the Exchange worked (3).
- Explore quality issues/concerns (2).
- Further cooperative marketing (1).

Respondents working for cities seemed more interested in trends and information than in sales. Private sector respondents were interested in making trades, pricing, and monitoring the market.

Those interviewees stating that they dealt in an array of materials (curbside mix, all, etc.) were almost exclusively looking for price information, or information on markets and trends. Most respondents involved in plastics, however, listed their main intention as buying or selling material. Those in specialty materials were looking for quality information (rubber) or to sell product (textiles). Respondents dealing in paper had a variety of reasons for subscribing to the Exchange.

The survey also asked about how the respondents were using the Exchange. Over 35% indicated that they had posted at least one listing. But in the same sentence, most (64%) of those stated that their listings had resulted in few leads and/or no new contacts. Almost 15% of all respondents specifically stated they had posted no listings. Three "monitored" the markets, and two noted that they suspected the pricing information to be inaccurate or misleading.

Several interviewees did state that trades had taken place as a result of their listings or they had found contacts. An equal number stated there were too few good listings for them to have concluded any trades.

In response to the question about system usage, respondents who were frequent users characterized themselves as "daily", "periodic", "regular", they "often track", "logged on periodically", or "active" users. Others said they were "not active", "didn't need it because they had plenty of leads outside", or "used a couple of times". Another "tried once", was disappointed, and did not do so again.

2. Suggestions for Exchange Improvement/Enhancement

The phone survey elicited responses for improving/increasing use of the Exchange. Comments, in decreasing order of frequency, were (number of mentions shown in parentheses):

- Do more/better marketing (13).
- Make system more user-friendly (8).
- Develop more users or more listings (8).
- Reduce fees or change the fee structure (6).
- Improve validity of listings, e.g., by requiring that specifications screens be filled in before a listing can be posted (6).
- Introduce a staffed help desk, a toll free number for assistance, an on-line chat or interactive capability (6).
- Establish/encourage standards and standardized materials (4).
- Revise screens (especially the quality screen and the printing/downloading screen) to make them easier to work with (3).
- Add more commodities (2).
- Add a newsletter with "success stories" to make the Exchange more real and encourage use; add regional price information; or consider interfacing with a cooperative exchange (1 each).

Some patterns emerged in these responses. Brokers, processors, and buyers requested "more listings". On the other hand, sellers, i.e., precisely those subscribers likely to have been suffering most in the poor markets occurring when these interviews took place in 1996, for the most part were the ones requesting "more marketing".

Specific targets for marketing included small users and markets, big buyers/end users, independent users, overseas markets, and West Coast recycling industry players. One subscriber suggested targeting non-traditional items to build the Exchange.

In sum, respondents to the summer 1996 subscriber phone survey raised several important issues:

- Users of the Exchange appeared to have completed very few transactions -- a result of too few listings, especially for paper and plastics.
- The Exchange provided little or no oversight/verification on the validity of buy or sell listings. As a result, some price bids and offers were unrealistic. Some listings had missing or vague material quality information. Other listings were out of date.
- Many subscribers were excited to begin with, listed a buy bid or sell offer, and then waited indefinitely. Nine months after launch, the Exchange still had too few users to sustain interest, develop momentum, help grow the program, or significantly change the recycling marketplace.
- Some subscribers felt that the system was not user friendly.
- Some subscribers, particularly larger and more established firms, were concerned about revealing confidential or sensitive information through listings that they might post on the Exchange. As a result, these subscribers did not post buy or sell orders. Instead, they perused the listings of others and then made contact off the Exchange.

C. 1996 EBBS-Exchange Subscriber In-Depth Interviews

As part of the research for his doctoral dissertation[8], a staff member of NYSORMD conducted in-depth interviews about the CBOT Recyclables Exchange with seven informants from the recycling industry. In the doctoral dissertation, and therefore in this report as well, the informants were kept anonymous. The seven interviewees represented four archetypal players in the recycling chain from waste generator to end-use manufacturer, as follows:

- A US paper manufacturer with mills located throughout the world.
- A regional Canadian paper manufacturer.
- A small PET and HDPE (high density polyethylene) plastics re-processor located in the Midwestern US.
- A small HDPE plastics re-processor located in the northeastern US.
- A small paper broker located in the Midwestern US.
- Two New York State municipalities.

This section summarizes the content and conclusions from those interviews, starting at the end-user (ultimate buyer) end of the recycling supply-demand chain.

1. The Large North American Paper Manufacturer

The interviewer identified the two paper mills as Mill USA and Mill Canada. Mill USA was a multinational corporation owning pulp, paper and paperboard manufacturing operations, as well as recycling facilities. Mill USA saw the source of virgin and recovered fiber as strategically critical and attempted to contract or control stable, good quality supplies for extended periods into the future. At the time of the interview, Mill USA had implemented a substantial degree of vertical integration back through their fiber supply chain.

[8] Dolan, *op.cit.*, 1998.

Mill Canada was a regional paper manufacturer located in Ontario. This mill also saw sourcing of recovered paper feedstock as critical to its success and future profitability. However, Mill Canada for the most part was not invested in recyclables collection infrastructure and processing facilities.

Reliable supply and quality at stable prices was the guiding principle for both mills in procuring recovered paper. Mill USA implemented this principle by arranging to have 15 to 25% more fiber available over some period into the future than would be needed by its own mills. This insured that none of its manufacturing facilities would run short of feedstock, a critical mistake that could shut down a multi-million dollar facility. Long-term commitments/contracts for fiber supply also helped hedge against dramatic increases in fiber cost, as happened during the summer of 1995. High prices signaled both tight supplies and increased costs, either of which was a threat to continuous operation of capital intensive paper manufacturing facilities. Ownership of recycling collection and processing facilities guaranteed a substantial portion of Mill USA's recovered fiber supply. Long-term contracts with guaranteed minimum prices and constraints on price increases insured another substantial portion. The oversupply strategy made Mill USA a seller as well as a buyer of recovered materials.

Mill Canada attempted to insure supply quantity and cost protection, less through ownership of recycling infrastructure and more by nurturing personal relationships with suppliers. While Mill Canada's relationships stopped short of legal partnership, it did contract with suppliers to buy their recovered paper over an extended future period, also with guarantees against too much price fluctuation. Mill Canada assisted their suppliers with processing facility productivity. Guaranteed price floors, commitment to buy paper week in and week out, and operational assistance all helped Mill Canada insure supply for its operations. During the market downturn in 1996, Mill Canada continued to take material as part of its partnering relationship strategy with its suppliers, with the result that it had to warehouse surplus recovered paper.

Neither mill felt much need to look for new suppliers. Both have established supply networks. The main use they saw for the Exchange was as a source for pricing and market activity information. In addition, Mill USA thought it might use the Exchange to market non-paper materials and oddball types of recovered paper that get generated through its recycling collection and processing operations. Neither expected to purchase normal grades of recovered paper on the Exchange.

2. The Small US Plastics Re-processor

Both Midwest Plastics and Northeast Plastics handled HDPE containers; the former also processed PET bottles. Both employed fewer than 50 people, and both hoped to expand vertically into the manufacturing of finished products. At the time of the interviews, they washed and chopped plastics containers into regrind (flake) and, for some materials, also melted and extruded the regrind into pellets.

These plastics processors felt threatened by their dependence on relatively few, large-scale buyers of their recovered plastic flake and pellets. A representative of Midwest Plastics said that he believed these large buyers found advantage in de-stabilized markets and lack of price informa-

tion. It put the small sellers of recovered resin at the big buyers' mercy, especially at times when prices were already low.

The representative for Northeast Plastics believed that the big molding companies bought 98% of their feedstock from virgin resin suppliers and did not need to cultivate good relationships with their recovered resin suppliers. Thus, the large buyers would not provide long-term purchase contracts to their recovered resin suppliers.

Both firms viewed the Exchange as offering them potential new markets and accurate information on prices and market trends. Northeast Plastics believed that with better information on what the market was willing to pay for HDPE, they would be better able to enter into long-term contracts with their suppliers that called for sharing the risk of price instability more equitably. At present, Northeast Plastics' representative felt that they bore most of the risk from price volatility. This representative also mentioned that material quality standardization was an important need that might be met through the Exchange's operations.

Both firms desired to better insure their supply of recovered plastic containers by building relationships with their suppliers. Midwest Plastics was attempting to cooperate on payment terms that gave the firm an incentive, say two percent off, if they paid their suppliers within ten to thirty days.

Publicly available, accurate and timely pricing information would also reduce trading conflicts between Midwest Plastics and its suppliers. Northeast Plastics indicated that a floor price for their suppliers and trading prices based on some kind of index would let suppliers and the firm move up and down together. This would protect Northeast Plastics from getting squeezed in the middle between opportunistic suppliers and large-scale buyers with significant market power.

Unfortunately, at the time of their interviews neither firm had made any sell orders through the Exchange. Northeast Plastics had even posted a low-ball sell listing and never received a call on it.

Midwest Plastics had transacted two buy orders with parties already known to the firm, but their main hope for the Exchange was that it would provide new markets for the firm's flake and pellets. Lack of response to sell postings had caused Northeast Plastics to cut back on their connections to the Exchange, reducing their activity to checking in just once or twice per month and restricting their sell listings.

3. The Small US Paper Broker

The Midwest Broker was the smallest firm interviewed, having fewer than five employees. The firm had no processing capacity, and sold about 10,000 tons of fiber per month.

The Midwest Broker spoke at great length about the need to develop opportunities for more transactions. Vertical integration in the paper industry back through the recyclables collection and processing infrastructure had reduced the number of suppliers that needed brokerage services.

This firm spent much time on the telephone trying to build and nurture new trading partner relationships. In response to vertical integration challenges from paper mills, the Midwest Broker communicated more with customers, and attempted to make clients aware of the value of brokerage services.

The Midwest Broker spoke about the Exchange as a way to find new sources of recovered paper supply and gather information on recovered paper prices. Conducting business through a desktop computer could also be a major improvement in efficiency. The firm had concluded four trades with paper mills over the five months following Exchange launch. These mills found the Midwest Broker's listings on the Exchange.

4. New York State Municipalities

The last two in-depth interviewees were municipalities in the state of New York. Both municipalities recycled several types of material, with MUNI 2 operating at a smaller scale than MUNI 1. MUNI 2 was trying to expand its market access by seeking to market recyclables from surrounding counties for a fee. Both viewed diverting material from disposal as the main objective for their recycling programs. Profitability for their recycling programs was an important, but secondary goal.

Both municipalities operated material recovery facilities (MRFs) and sold the majority of their materials on a spot market basis. The municipalities did not pursue long-term contracts because by acting opportunistically both municipalities believed that they could get better prices over time.

The municipalities believed the Exchange to be a way of identifying new buyers, and in the case of MUNI 2, new sellers, and of gathering information on pricing and market trends. Given this perspective it was somewhat perplexing that neither municipality had actually made a trade on the Exchange. Both mostly used the Exchange passively, as a way to watch what seemed to be happening in the recycling marketplace. When MUNI 1 did post a sell listing they put in a selling price that was at a premium over what they were getting from their broker. Not surprisingly, MUNI 1 got no response to this sell listing. At the same time, both municipalities expressed disappointment at the level of activity on the Exchange.

D. 1998 Internet-Exchange Registrant Phone Survey

During 1998, NRC phoned over thirty-five registrants on the Internet-based Exchange to inquire about their use of the Exchange, their reasons for using it or not using it, and how the Exchange could be improved to encourage its use. Twenty-seven of these registrants answered most of the questions in the phone survey. Eleven of the respondents were recyclers and/or MRF operators; seven were brokers; seven were re-processors (of plastics, rubber, or glass); and two were end users.

Most (70%) of the respondents were using the system in 1998. Current users reported completion of 19 trades through the Exchange, with one paper broker claiming 12 of those. This broker said he initiated these trades through the Exchange, but now calls direct. One of the respondents no

longer using the Exchange had previously completed 4 trades, bringing reported trade completions to 23 in total for the 27 respondents.

About half reported that they used the Exchange's specifications when posting buy parameters or sell listings. The eight respondents (30%) who did not use system specifications reported, for the most part, inserting their own specifications more relevant to the material they were listing. Or they reported waiting for contact with a trading partner to discuss detailed quality specifications. Six interviewees (22%) gave no response to the question about whether they used the quality specifications listed on the system.

When the NRC interviewer asked what attracted them to use the Exchange, over half indicated they expected to find new markets and/or supply sources. Several joined because it represented the wave of the future or the new thing to try. Others mentioned that articles or other information that they saw in trade publications attracted them.

When the NRC interviewer asked how the Exchange could be improved or why they had not been using the Exchange, respondents gave a variety of answers. About half mentioned there were too few users and/or too few listings on the Exchange. Most respondents expressed frustration with slow or no response to their postings, the inability to contact buyers directly (system too passive), and the lack of a way to track how many users had looked at (hit on) their postings. Several respondents mentioned missing, completely misleading, or wrong price information as another complaint. One suggested that CBOT require price information for all postings. Respondents also mentioned other types of missing or out-of-date information on postings as something needing attention.

E. 1999 Internet-Exchange Registrant Phone and E-Mail Surveys

NRC retained the Center for Solid Waste Research (CSWR) during the late summer and fall of 1999 to facilitating trading on the CBOT Recyclables Exchange. In carrying out that work, CSWR conducted both phone and e-mail surveys of Exchange registrants.

For the phone survey, CSWR contacted about 40 buyers and 25 sellers. As explained in CSWR's project report:

> "The overall scope of this project was based on the assumption that there were active users of the CBOT Exchange system engaging in trade. Extensive investigation determined few registered users regularly update their listings on the system. Contact was attempted with all sellers with listings. A number of these users could not be contacted because either their telephone number was no longer valid or their e-mail addresses no longer worked. Of those contacted (approximately 25), not a single one could recall being approached by a buyer to discuss a sale.
>
> "To supplement these initial contacts, the trade facilitator contacted a group of 40 major 'buyers.' These users also indicated that they had not made any trades. A number of those contacted in this group were early users of the system. Most in this group said that they had posted early listings but had discontinued use after several months due to inactivity or a belief that they received no added benefit from posting listings. In several cases,

materials source managers indicated that they had access to enough markets without the use of the CBOT Exchange.

"While most users disclosed that they felt there was little, if any, added benefit from the system, it is important to note that a number of users contacted had not accessed the Exchange for a significant period of time due to lost or forgotten log-on information. In most cases, this log-on information was subsequently forwarded by the trade facilitator to the parties in question. There has also been increased activity on the CBOT Exchange since this information was transmitted. Whether there have been any trades is beyond the timeframe of this analysis.

"Additionally, several key mill buyers and materials sourcing agents said that they did not feel comfortable doing business over the Internet in that the purchase of recovered material necessitates visual inspection of material and long-standing mutually trusting relationships. One buyer noted: “This isn’t a science, it’s an art.”

"Another concern buyers and sellers both have is the issue of transportation. There are many variables and standards that go into company equations, but for the most part, buying and selling material beyond a 100-mile radius is seen as cost prohibitive. As a transnational marketing tool, the perception is that CBOT has limited practical value."[9]

CSWR also attempted to deliver an e-mail survey to every registrant on the Exchange. Over a hundred of the registrants had invalid e-mail addresses, but CSWR successfully delivered about 400 surveys. Registrants returned forty- four surveys.

Of the 44 respondents, 50% (22) had visited the Exchange's Internet site cbot-recycle.com in the last nine months, i.e., essentially sometime in 1999. But 50% had not. The reasons respondents gave for not visiting the Exchange included:

- System or user issues such as forgotten password or difficulty using the system.
- Lack of success with the Exchange in the past.
- Too few users, too little activity.

Only 45% (20) of respondents had ever posted a buy parameter or sell listing. None (0) had ever bought or sold any commodities using the system.

In answer to a request for suggestions or recommendations for enhancing the Exchange to make it more useful to them, respondents indicated that the Exchange needed to have more users, more listings, and more activity. They suggested making the site more attractive by, for example, making it easier to use (Recycler's World at recycle.net given as an example), offering auctions (eBay at ebay.com given as an example), providing pricing information, and putting the human element back into the system.

[9] Center for Solid Waste Research, *Project Report: Trade Facilitation Research for the Chicago Board of Trade Recyclables Exchange*, presented to the National Recycling Coalition, December 15, 1999, pp. 3-4.

VI. Non-Users -- What They Said

To gain perspective as to why certain groups chose never to use the CBOT Recyclables Exchange, the evaluation team interviewed staff from 23 recycling industry organizations and businesses in April and May, 2000. The evaluation team did not select his group in a manner that would allow the results of the interviews to be interpreted as statistically representative of recycling industry organizations that never used the Exchange. Nevertheless, the respondents did identify their roles in the recycling industry. The group's composition -- 13 municipalities, 5 processors, 3 brokers and 2 collectors/haulers -- appears diverse enough to assume that their opinions are illustrative of major issues and barriers that prevented the Exchange from gaining more widespread use.

The non-participant interviews focused on a variety of topics, including:

1. Familiarity with the Exchange.
2. Exchange features.
3. Perceived credibility of agencies involved.
4. Exchange strengths and weaknesses.
5. Barriers to participation.
6. Recycling issues.
7. Usefulness of this type of service.
8. Emergence of online recovered materials trading.

A. Familiarity with Recyclables Exchange

Over one third of the non-user interviewees learned of the Exchange through trade journal advertisements, while another quarter had been asked to participate in, and did attend, one or more of the initial workshops or focus groups. Five learned about the Exchange through their state's recycling organization or the NRC. Two saw outreach materials. One heard about the Exchange at a company meeting and another at an unspecified conference.

Most (70%) of the non-participants were familiar with the Exchange. On a scale of 1 to 5, the average familiarity score was 2.69, with rankings ranging widely between 1 for low and 5 for high familiarity. Satisfaction with Exchange outreach materials received a lower average ranking of 2.23, with ranks again ranging between 1 and 5.

B. Recyclables Exchange Features

The evaluation team asked respondents to name primary features of the Exchange, but provided no lists or examples to prompt responses. Eleven interviewees (48%) listed the main feature as an online forum for buyers and sellers of recovered materials. Four (17%) thought that the Exchange's main feature was a pricing database, and three thought it provided a futures market for recovered materials. In addition, six (26%) could not recall, without prompting, any features of the Exchange. These responses indicate a substantial lack of understanding about the Exchange among non-users. Typically, staff from the private sector demonstrated a better understanding of the Exchange.

Interviewers from the evaluation team also asked non-participants to list the problems or concerns the Exchange was trying to address. Interviewees provided a total of only 16 responses in answer to this question, with 9 or 57% of those indicating that there were no problems in the recycling marketplace for the Exchange to address. Non-users listed helping to stabilize markets and helping to match buyers and sellers, each mentioned twice. Other problems that non-users thought the Exchange was trying to address included providing honest price information and making marketing easier, each mentioned just once.

The non-users that thought the Recyclables Exchange was addressing a non-existent problem were almost all from the private sector. Typically, their responses were something along the lines of, "Well, I know what *they* thought the problem was (lack of demand, market volatility, etc.) But in actuality, the market was slow during this time period, and the material quality coming from municipalities was inconsistent."

One private sector respondent offered this extended explanation. "Municipalities confused collection with consumption and were astounded when the industry was not clamoring to buy their material. These were slow times and they were having difficulties in consistently providing quality material. However, the municipalities construed this as an industry-wide cabal and complained to the NRC and other such organizations. They devised the CBOT Exchange, and while it was being set up, we explained that this was not how we did business. They didn't listen…and the Exchange failed."

C. Recognition and Perceived Credibility of Agencies Involved

Non-users had difficulty listing the Exchange's sponsoring agencies other than the CBOT without prompting. About one in five listed the National Recycling Coalition, but less than one in five could name any of the remaining co-sponsors.

Interviewers then provided each respondent with the name of the co-sponsoring agencies and asked them to rank, from one (not credible) to five (very credible), how much credibility the agency's name brought to the Exchange. NRC, EPA, CWC and NYSORMD all received average rankings of about 2, with NRC the only co-sponsor receiving a very credible ranking of five from any of the non-users. It should be noted that many respondents seemed to harbor negative feelings toward the Exchange in general, and these results are consistent with that sentiment.

D. Recyclables Exchange Strengths and Weaknesses

Non-participants, by and large, indicated that the Exchange had demonstrated few strengths and many weaknesses. Nearly half of the respondents said the Exchange had no strengths. The bulk of these negative responses came from the private sector. Three non-users listed 'a source of market information' as a strong point for the Exchange. Non-users did not list any other strength more than once. Municipal respondents tended to account for most of these. Strengths that non-users mentioned once included: legitimized recyclables trading, innovative, broadened the market, consistency, good for those with large quantities, and independent.

In terms of perceived weaknesses in the Exchange, private sector respondents felt very strongly that there was no quality standard or consistency for certain materials. One respondent said, "Paper is not a commodity. There is no standard grade of paper." Other non-users cited the in-

ability to visually verify quality of material before time of purchase. Another six non-users (26%) indicated that a major weakness was that the Exchange was too complicated. One respondent said, "Too much thought was required of the user and I just said 'forget it'". Four others indicated that from its inception they felt the Exchange was destined to failure, and that, in and of itself, was a serious weakness. Other weaknesses noted were that the Exchange was unnecessary, too time consuming, and not local, and that the Exchange lacked credible price information and industry participation.

E. Barriers to Participation

When the evaluation team asked non-users to list the primary reason or reasons their firm or organization decided not to participate in the Exchange, non-user responses were closely linked to their perception of Exchange weaknesses. Equal numbers of municipal and private sector interviewees, in total 8 of the 23 non-users, or 35%, indicated that participation in the Exchange was unnecessary. Most municipal respondents said they already had acceptable outlets for their material. Private firms stated that their existing relationships were strong enough not to warrant "taking risks" on the CBOT.

Private sector respondents listed the lack of standards and consistent material quality as a barrier four times. One interviewee said, "Bottom line, what we want is steady, quality tons, at a known price. We didn't feel the Recyclables Exchange program could do that for us."

Non-users mentioned other barriers to participation, including the feeling that the Exchange was too complicated, mentioned three times; and that the Exchange was not a good program, removed the personal relationship, and seemed risky, mentioned twice each. Once-mentioned barriers included that the Exchange was not local, not cost effective, and lacked industry participation.

F. Recycling Issues

Interviewers probed both buyers and sellers regarding current recycling market conditions. Sellers and buyers ranked how much they agreed or disagreed with the statements listed for each side of the marketplace in Tables 3 and 4, respectively.

Sellers

Most sellers, on the whole, felt they knew when they were getting a good price for their materials. Municipalities tended to not be quite as confident as private sector respondents, however.

As far as selling to one agent, most private sector respondents indicated that they sell to more than one agent per material, but that those relationships were strong and time-tested. More often than not, municipalities had contracts with a particular processor that handled the material sales, and in turn, shared the revenue.

Interestingly, almost every non-user interviewee mentioned that the prices in trade journals are all over the spectrum, with some being representative, and some not. One non-user said, "Bad question, because there will always be some journals that have it dead-on, while others will just be ludicrous."

Table 3
Sellers' Issues in Recycling

Issue	Score (1=strongly disagree; 5=strongly agree) Average	Range
I know when I get a good price for my materials	3.94	1 - 5
I have plenty of places to check my prices	3.76	1 - 5
I tend to sell to 1 agent with whom I have a relationship	3.39	1 - 5
I am not sure where I would find out about other sellers	1.78	1 - 5
I can easily sell my materials for acceptable prices	3.61	1 - 5
Prices in trade journals are fairly representative of ours	3.00	1 - 5
The quality of our materials has been easy to sell	4.17	2 - 5
We use computers a lot for email, internet, etc.	4.06	2 - 5

Buyers

The buyers questions were answered exclusively by private sector firms. Most non-users that were buyers indicated that they have minimal problems finding suppliers, but that the actual supply could be increased. This illustrates that while firms indicate a need for more supply, they are content to rely on their existing contacts for material.

While buyers mentioned quality and consistency of recovered materials as a key weakness and barrier to Exchange use, buyers indicated that, for the most part, quality of the recovered materials they buy has been consistent.

The statement regarding prices in trade journals and magazines elicited the same response from buyers as it did from sellers. Most felt that some journals were fairly accurate and some were not.

Table 4
Buyers' Issues in Recycling

Issue	Score (1=strongly disagree; 5=strongly agree) Average	Range
I have a list of plenty of suppliers	4.29	1 - 5
I have been able to get adequate supply	3.43	1 - 4
Material quality has been fairly consistent for our use	3.86	1 - 5
Prices in journals are representative of what we pay	2.29	1 - 3
We use computers a lot for email, internet, etc.	3.57	2 - 4

G. Usefulness of Services Offered by the Exchange

The evaluation team interviewers asked non-participants to gauge how useful certain aspects of an e-commerce exchange could be to their business or community. As shown in the results listed in Table 5, non-users were mildly skeptical as to how useful a trading database would be to their operation. However, usefulness increased substantially if the database included accurate price information. Most felt that their current markets were strong and were relatively indifferent to the prospects of finding a better market through e-commerce.

As indicated by non-user responses to previous questions in the survey, many viewed the Exchange negatively. Thus, it is not surprising that most (80%) felt that no improvement to the Exchange would have enticed them to participate in e-commerce. Nearly all of the private sector respondents had a fundamental problem with the concept of a recyclable commodities exchange, while most municipalities felt the Exchange was not applicable to their current arrangement. Specific features of e-commerce that might result in their considering its use included material quality standards for suppliers, legitimate pricing information, and provision of features that would simplify and enhance existing trading relationships.

Table 5
Usefulness of E-commerce Services

	Score (1=very low; 5=very high)	
Issue	**Average**	**Range**
How useful would a database of trades be	2.80	1 - 5
How useful would a pricing database be	3.40	1 - 4
How would you rate your current recycling markets	3.83	1 - 5
How likely are you to find a better market	3.11	2 - 5
Could the Exchange have been improved	1.56	1 - 5

H. Emergence of Recycling E-commerce Sites

Twelve, or just over half of the non-users surveyed were aware of the emergence of other recycling e-commerce sites. Specifically, non-users mentioned PaperExchange.com, fibermarket.com, paperloop.com, e-Cycled.com, eFibre.com, recycle.net, fobpaper.com, and pulpandpaper.net.[10] However, only one of the non-users surveyed is currently committed to utilizing these services. Half said they have no plans to access these sites, while just under half said they have not totally ruled participation out. Some of those who said they might consider participating in e-commerce indicated that they are looking at establishing ties or developing an arrangement with a specific site.

When interviewers asked why they were interested in these emerging sites, but not in the CBOT Exchange, most non-users indicated the increased role of computers as the main factor. 60% said they previously lacked computer and Internet skills and 71% said they had now accepted the ex-

[10] Interestingly, at the time of the survey three of these sites did not deal in recycled materials, i.e., paperloop.com, fobpaper.com and pulpandpaper.net.

istence of e-commerce. One respondent said, “the CBOT Exchange was probably ahead of its time.”

Some also believe other sites have features not offered by the CBOT Recyclables Exchange. Whether this is a true belief is hard to discern from survey responses. However, one non-user, referring to the original Exchange design, said “bulletin board systems aren’t as convenient to use as the Internet because you always have to a dial up a bulletin board system, whereas you can stay connected to the Internet indefinitely.”

I. Summary of Non-Users Survey responses

Out of 23 interviews with staff from both public and private sector market actors who did not participate in the CBOT Recyclables Exchange, the vast majority of respondents felt that the program did not pertain to their specific situation. Many respondents felt that the program was ill conceived, and that mechanisms already in place rendered it unnecessary.

Nearly all of the private sector respondents had a fundamental problem with the concept of a recyclables commodity exchange, because of the varying quality of material and the lack of a quality verification method. They also indicated that their business dealings rely on personal relationships and use of the Exchange would run counter to that.

Most municipalities felt the program was not applicable to their current arrangements, as well. Many municipal governments had exclusive contracts with haulers and processors, some relied on local spot markets, and still others felt that they lacked the volume of material to participate.

About half of the respondents indicated that they were at least considering utilizing the newer e-commerce sites. However, many were doing so with the intention of simplifying transactions with existing businesses. The main reason cited for having interest in these sites but not the CBOT site was the increased importance of computers and the Internet.

VII. The CBOT Exchange and the Recycling Marketplace

A paper industry broker in correspondence related to this evaluation project stated:

> "Frankly, the CBOT was too soon, not completely well thought out, not as user friendly as it could have been, and was directed to a generation that had not grown up with the concept of the Internet. This is changing. Its role was a precursor. I do not believe it impacted anything but the beginning of an attitude change … no markets, no difference in trading methods, no impacts on grades and pricing. Its impact was on attitude and psychology…"

Previous chapters have explored the attitudes and opinions of Project Partner staff involved in designing and setting up the Exchange, of members and guests who used the Exchange in one way or another, and of recycling industry players who never used the Exchange. This latter despite the fact that 70% of these non-users had heard about the Exchange and 26% had participated in at least one of the initial outreach workshops or post-launch focus groups. This chapter attempts to describe whether and how the Exchange interfaced with, was influenced by, and perhaps influenced the wider recycling marketplace.

The evaluation team used comparisons of Exchange characteristics and marketplace conditions and trends during the 1996 through 1999 period to analyze a variety of issues regarding the CBOT Recyclables Exchange. These issues include:

- How marketplace trends impacted the Exchange.
- The extent to which the Exchange achieved the goal of providing a centralized marketplace.
- The treatment of buyers versus sellers on the Exchange.
- The extent to which the Exchange achieved the goal of providing price discovery.
- The functionality and acceptance of the Exchange's material grade definitions and specifications.
- The usefulness of the Exchange's material quality testing protocols and dispute resolution procedures.

A. Marketplace Price Trends and Exchange Buy/Sell Listings

Chapter IV provided evidence regarding dead weight on the Internet-based Exchange caused by out-of-date sell listings and buy parameters. The evaluation team also noted in that chapter the lack of correlation between buy or sell listing trends and number of matches delivered. Furthermore, this report has mentioned the lack of any data on completed trades, either in terms of prices paid or received or quantities traded, other than information on five transactions submitted under the EBBS-Exchange's trade recordation process within the first few months of launch in October 1995. In fact, the Exchange as operated by GRN had no capabilities whatsoever for recording transactions.

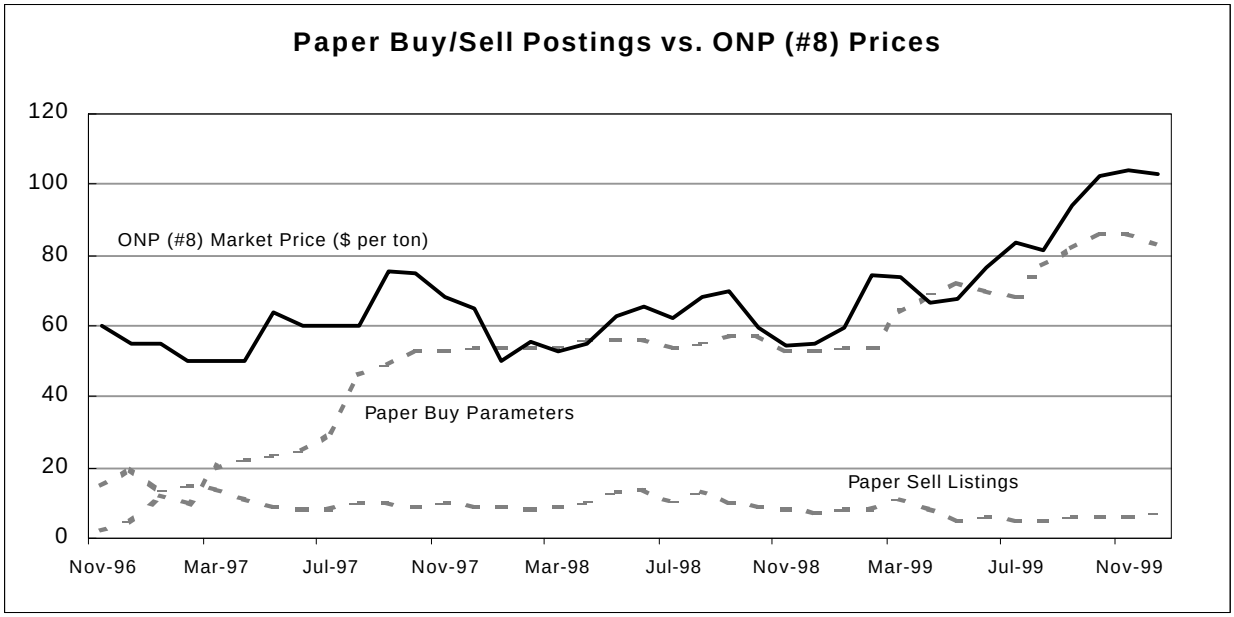
User interview data does indicate that some Exchange members were successful at making trades based on Exchange contacts. Furthermore, perusal of the Exchange activity log for 1997 through 1999 shows some very active members in terms of logins, buy or sell listings and updates, and notification of matches delivered. On the other hand, that log also shows that some members entered buy parameters and/or sell listings and never changed them for months, and in some cases years, thereafter. Furthermore, the activity log shows that 43% of registrants never entered a sell

listing or buy parameter, never updated a listing or parameter, and never received a match during the time they were registered as users of the Exchange on the Internet. Another 20% entered only one sell listing or one buy parameter.

Despite this evidence that the Exchange was populated with lots of "Looky Lous" and/or information-only seekers, some members actively responded to changes in recycling market conditions during the Exchange's Internet phase. For example, as Figure 5 indicates, buy parameter postings for paper correlated quite highly with ONP market prices during that period of time.

Figure 5 compares buy and sell postings on the Exchange for recovered paper grades against market prices for Institute of Scrap Recycling Industries (ISRI) grade (8) Special News De-ink Quality. Number 8 is ISRI's grade for old newspapers (ONP) that have been collected and processed so as to be suitable for deinking and repulping to manufacture recycled-content newsprint. The prices shown on Figure 5 are FOB shipping dock for baled ONP (#8) from large scale MRFs operating in the Pacific Northwest.[11]

Figure 5



There were relatively few sell listings for paper on the CBOT Exchange -- the number of sell listings fluctuated in a narrow band between 5 and 15, with the exception of November 1996 when there were 20 -- so it is not easy to tell from Figure 5 whether paper sell listings were correlated with market prices. In fact, paper sell listings also responded to changing market trends, as shown by the correlation coefficients listed in Table 6 which indicate that sell listings were significantly and negatively correlated with prices for recovered newspapers on both sides of the continent. That is, in times of strong market demand when prices were moving up, members of

[11] As indicated by correlation coefficients shown in Table 6, comparisons with northeastern US market prices yield similar conclusions regarding correlation between Exchange postings and market price fluctuations for recovered paper grades.

the Exchange were posting fewer sell listings. As ONP market prices moved down, Exchange members posted more paper sell listings.

Correlations between northeastern or northwestern market prices for mixed paper and paper buy parameters as well as sell listings are also significant. On the other hand, results for old corrugated cardboard (OCC) market prices are less strong, with insignificant correlation between postings and northwestern market prices, while correlations with northeastern prices are significant at the lower 95% confidence level. This result for OCC is consistent with the hypothesis that members used the Exchange as a potential market for less well-established recovered materials. For the bulk recovered paper grades this would mean more use of the Exchange to market mixed paper and less use to market OCC. Old newspapers would fall in between, but tend to be more like mixed paper than OCC in terms of width and depth of the market for ONP.

Table 6
Correlation between Buy/Sell Postings & Market Prices
(Nov 1996 - Dec 1999)

	ONP	OCC	Mixed	HDPE	PET
Buy Parameters					
Northeast	.83[1]	.35[2]	.93[1]	.66[1]	.32[3]
Northwest	.71[1]	.07[3]	.79[1]	.80[1]	.53[2]
Sell Listings					
Northeast	-.73[1]	-.36[2]	-.73[1]	-.39[2]	.21[3]
Northwest	-.52[1]	-.15[3]	-.64[1]	-.55[1]	.38[2]

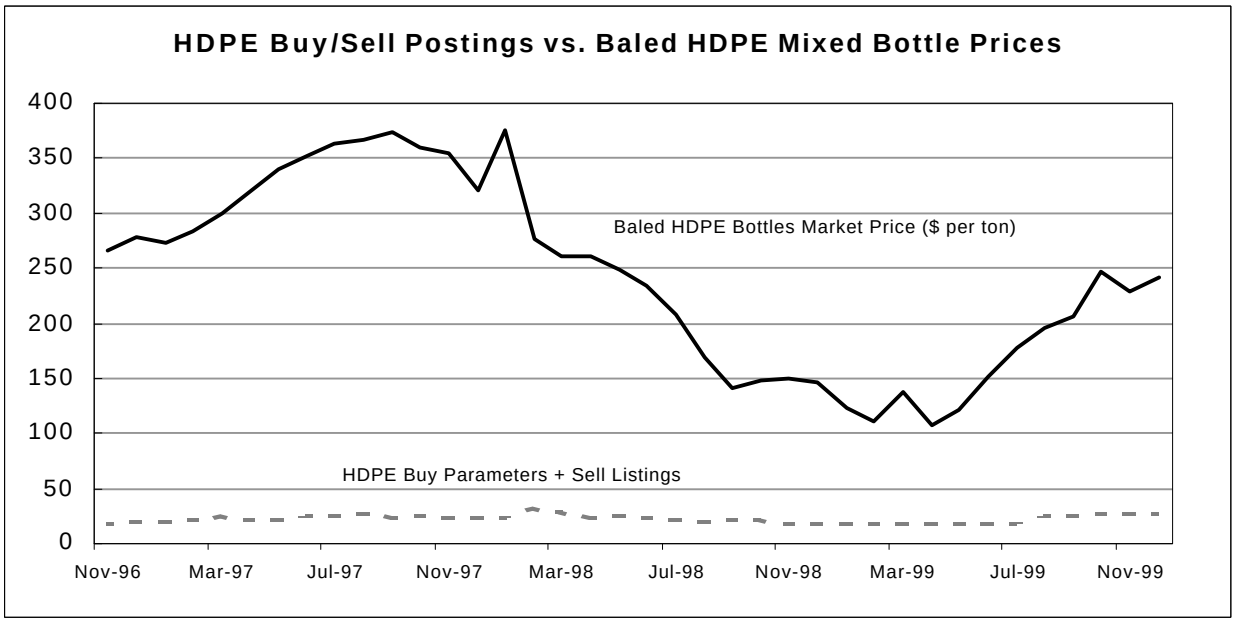
[1] Significant at 0.99.
[2] Significant at 0.95.
[3] Not significantly different from 0 at 0.95 confidence level.

Figure 6 compares buy parameter plus sell postings on the Exchange for recovered HDPE against northwestern market prices for baled mixed natural and colored HDPE bottles.[12] Sell listings for HDPE on the Internet Exchange fluctuated in a narrow band between 5 and 9, while buy parameter postings fluctuated between 12 and 25. As was the case with paper, buy parameter postings showed more movement over time than did sell listings. However, it is difficult to tell from Figure 6 whether HDPE postings, and in particular buy and/or sell postings, moved in response to changes in market conditions.

Table 6 does show that both buy parameter and sell listing postings for HDPE moved in synch with market prices for recovered HDPE. As was the case for paper postings and prices, HDPE buy parameters were positively associated with market prices, while sell listings moved inversely to market prices. These results are consistent with the hypothesis that members used the Exchange as a market of last resort. That is, in times when market prices were moving higher and market supply tended to be tighter, buyers went on the Exchange to look for more material and better deals. When market trends moved down and supply became more plentiful relative to demand, sellers went on the market looking for a buyer and, perhaps, a better deal on price.

[12] As with ONP, comparisons with northeastern US market prices yield similar conclusions regarding correlation between Exchange postings and market price fluctuations for HDPE.

Figure 6



Finally, Table 6 indicates that PET postings on the Exchange moved less strongly with market price trends. Like OCC relative to mixed paper or ONP, PET relative to HDPE is the more established material in recycling markets. In addition, because so much of recovered PET supply comes from beverage containers, a large portion of which originates in the bottle bill states, the elasticity of PET supply is probably lower than the elasticity of HDPE supply. This would tend to weaken the link between market prices and changes in buyer or seller behavior in response to market trends.

B. Centralized Marketplace

Project Partner interviews summarized in Chapter III identified several problems in the recycling marketplace -- inefficiencies such as failure to match up buyers and sellers, lack of information on recycling prices, and lack of uniform material specifications. Those interviews also identified several objectives for the Exchange -- increase market efficiency through such methods as expanding access, providing price data for actual trades, and developing industry-wide specifications, and increase the visibility and credibility of recovered materials as useful commodities.

In a broad sense these problems and objectives can be traced to the lack of an all-player-accessible centralized market for recovered materials. With the Exchange's national media covered launch, eventual $10 registration fee Internet platform, definitions of terms for posting hundreds of different recovered materials, and members from over 40 countries and virtually every state, the CBOT Recyclables Exchange certainly was center stage as prime contender for becoming one of North America's main centralized marketplaces for recyclables, just as, say, the New York Stock Exchange is for stocks or the CBOT is for commodity futures.

If users had recorded at first hundreds and then thousands of daily transactions, the CBOT could have easily generated average price data on at least a monthly basis for numerous recovered materials. Multitudes of transactions would have provided online markets for the small buyer or

seller, just as the New York Stock Exchange accommodates transactions involving only one share should a shareholder wish to incur brokerage charges on such a small transaction. Of course, many brokerage firms currently facilitate marketing and/or actually provide markets for small buyers and sellers, so the CBOT Exchange would have had to compete this business away from those brokers. This may account for some of the distrust and hostility expressed by some brokers toward the Exchange.

Unfortunately, the Exchange never achieved trading volumes sufficient to actually become North America's recycling marketplace. Yet judging by publicity generated by the Exchange's launch and its pioneering efforts at operating an electronic marketplace, as well as by user and non-user interviews, the Exchange did raise awareness of recycling and increase the credibility of recovered wastes as useful materials for manufacturing many new products. The Exchange's failure to generate any trading volume of consequence also served to warn other e-commerce ventures that building a low-cost, readily-accessible site was not sufficient to induce enough serious buyers and sellers to come to market.

C. A Market for Buyers in a Buyer's Market Time

Launch of the Recyclables Exchange happened to occur just as recycling markets for mixed paper, newspapers, cardboard boxes, plastic bottles and aluminum cans were careening down from historical highs attained during the first six months of 1995. Figure 7 provides a perspective on this extreme price cycle in terms of average value for a ton of curbside recyclables.[13] The chart indicates that the value of materials collected in a typical northwestern US curbside recycling program rose dramatically and almost monotonically from a ten-year low of $31 per ton in June 1993 to a historical peak of $169 by June 1995.

During the market's climb recycling collectors and processors -- the supply side of recycling markets -- enjoyed unprecedented revenues. What had been a deeply depressed buyer's market for more than five years turned into a raging seller's market almost overnight. This was a quick and shocking turnabout in markets where buyers had become accustomed to picking and choosing among competing sellers, a result of the surge in recycling collection programs beginning in the late eighties that had left markets with increasing supply without concomitantly growing demand.

During the 1994-1995 bull market[14] some sellers reportedly broke long-term relationships with buyers, baled out of fixed price contracts, and/or played buyers off against each other, all as a way to maximize revenues. Some collectors, believing that recycling had entered its golden age, made commitments to waste generators to provide recycling collections at no cost or substantially lower cost than had previously been available.

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[13] Average value is the weighted average of per ton prices for mixed paper (33.3%), newspaper (33.3%), cardboard (5.0%), glass (21.0%), tin-plated steel cans (3.4%), aluminum cans (2.0%), PET bottles (1.0%), and HDPE bottles (1.0%), using the weights shown in parentheses for each material. The per ton price for glass itself represents a weighted average of prices for clear, green, brown, and mixed color cullet.

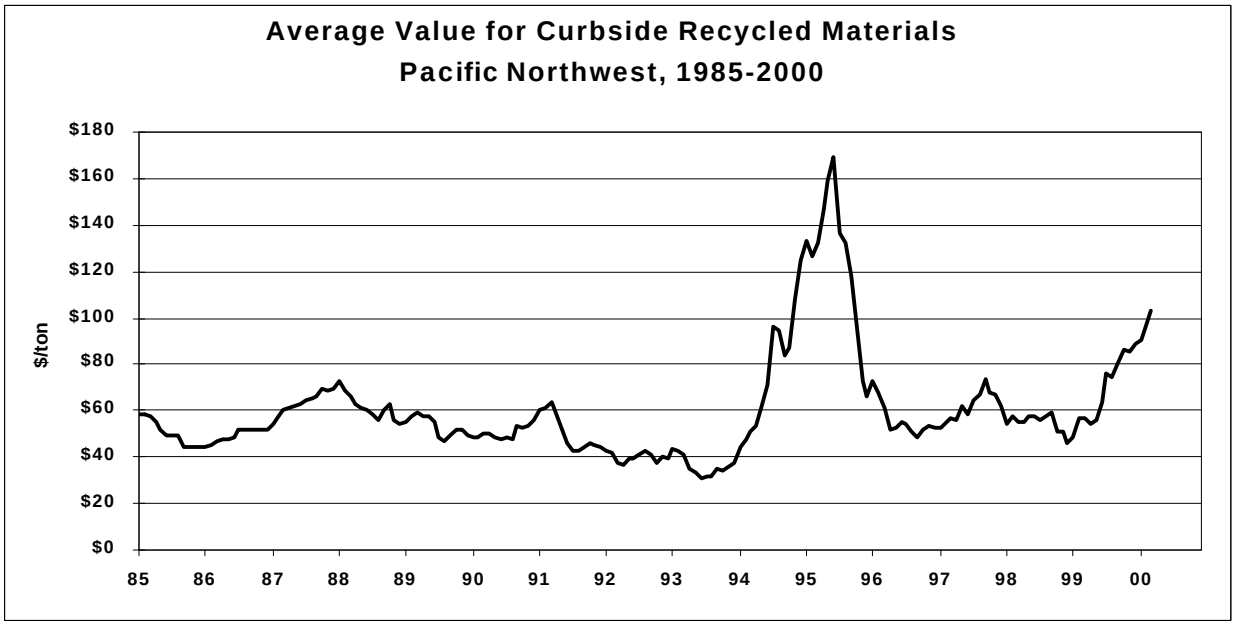
[14] Bull market is a commonly used description for markets that are charging, somewhat blindly, upwards. Bear market, by contrast, is the term often used to description markets crashing pessimistically downwards.

The ride back down was more precipitous and sudden than the climb, with market value for curbside recyclables in the Pacific Northwest falling from the June 1995 peak of $169 to $49 per ton by September 1996. After that low point, average market values for curbside recyclables moved up through the fall of 1997, then fell off to a low of $46 per ton in December 1998. During 1999, the last year of Exchange operation, market prices increased strongly, although the trend up was not as sharp as the 1994 surge.

One can hardly overstate the significance of these market movements for the Exchange. Economic collapse in Asia and an increasing supply of cheap virgin materials, stimulated in part by high recycling prices during 1994 and 1995, combined to put recyclables once again in an excess supply situation by the time the Exchange opened its doors. Buyers were returning to their customary position of being able to pick and choose among scrambling suppliers and had no particular need to invest time in learning to look for material via this new trading medium.

In addition, members and potential users of the EBBS Exchange had suggested that lack of pricing anonymity caused some of their reluctance to use the Exchange. The CBOT and other Project Partners, understandably in search of more Exchange activity, agreed to this request for more anonymity. By the time the Exchange switched to the Internet, sellers were passive market players -- unable to directly contact a buyer even when a seller found an interesting buy posting. Instead, a seller had to wait for a buyer to call. Buyers themselves only received a seller's name and contact information when the Exchange's computer system found that a buyer's posting matched a seller's listing and so notified the buyer. This system restricted assertive marketing on the Internet-based Exchange by users, especially sellers. It also made the Exchange even more of a buyer's market at a time when sellers were desperate to make a deal.

Figure 7



Looked at from this perspective it's hard to see how the Exchange could have succeeded. In addition, the Exchange had no rules to prevent bears from scavenging for cheap lunches. For example, at December 31, 1999, there were 83 paper buy parameters listed. Of these, 43 contained no price information, 20 had bid prices that were astonishingly far below current market prices for the particular grade listed, and only 20 had bid prices that were reasonable relative to then current market prices. At that same date there were far fewer sell listings for paper, only seven. But of these, five had reasonable ask prices and one was without price information. Only a sell listing for a specialty grade of paper with no established market may possibly have had too high a price.

Information on buy parameters in 1999 does not necessarily mean that buy postings when the Exchange opened in the fall of 1995 were also as distorted or noncommittal. On the other hand, with recycling markets in free fall in late 1995 versus surging strongly upward in late 1999, it's hard to imagine that the buy postings could have been much better then. If they were not, it's easy to believe that the early bears frightened enough potential sellers away to cause word to spread that the Exchange was no place to market recyclables. Nothing substantial was ever done to restructure the Exchange to favor sellers as much as it appeared to favor buyers.

D. Price Discovery

Both the Project Partners and Exchange users often mentioned improving the availability and accuracy of recycling market price information as one objective for design and development of the Exchange. The expectation of Project Partners was that Exchange members would voluntarily record price and quantity information for completed transactions for two main reasons. One, members would make the Exchange privy to their transactions in part to allow use of the Exchange's material testing and dispute resolution procedures should a disagreement arise between buyer and seller at any point up to and including final delivery of recovered materials. And two, members would also want to facilitate the Exchange's gathering of data to compute average prices that reflected the Exchange's ongoing transactions for their benefit.

As previously mentioned, buyers and sellers actually recorded only five transactions out of a somewhat larger, but probably still not noteworthy, number of completed trades accomplished through Exchange postings. At the same time, the number of postings, especially sell listings, on the Exchange for any given material was never sufficient to yield statistically reliable averages reflecting real market values for any particular material even if all postings had yielded a trade and traders had recorded all transactions. For example, there were never more than 20 sell listings posted at any one time in total among all 46 regular and 33 specialty ISRI grades for recovered paper stock. Particular sell postings for paper were scattered across the gamut of these 79 ISRI grades with no concentration of postings in any one particular grade.

The price discovery objective for the Exchange never came to fruition in practice. However, a related development in the recycling industry is, at least in part, the outgrowth of discussions about need for a futures market that occurred during the Exchange's development and launch. That is the increasing realization that hedging mechanisms are needed to offset risks associated with price volatility in recycling markets. In fact, initial consideration of the need for a central market for recyclables arose, in part, out of the belief that a futures market might be a useful method for hedging recycling market price volatility.

In the years since the Exchange's launch many buyers and sellers have entered into longer-term contracts as a way to hedge against the extreme price volatility encountered during the 1994-96 period. In addition, several private concerns have actually begun to offer financial hedges for recycling prices. A financial hedge contract allows its holder to "lock in" a price for some recovered material at some point in the future. The future price is guaranteed in the sense that the hedge contract holder gets paid the upside or downside difference between the price stipulated in the hedge contract and the actual market price for the material at the future date stated in the contract.

The upside difference would be paid to a contract holder who wanted to hedge against high market prices. This would typically be a buyer of recovered materials such as an end-use manufacturer. The downside difference would be paid to a holder hedging against low market prices. This would typically be a seller such as a recycler or processor.

Unlike a futures contract, which does specify transfer of physical ownership of a commodity at some designated location at a given future time, a hedge contract does not involve even the potential transfer of physical ownership of a commodity. However, the hedge contract holder achieves the same financial outcome as if they had been able to make a futures market transaction at the "lock in" price specified in the hedge contract.

As a result of Project Partners interest in establishing mechanisms to help industry players cope with recycling market price volatility, one of EPA's grants that supported design and development of the Exchange also funded a project to pursue creation of a reliable, statistically-based, and verifiable historical market price series for at least one recovered paper grade. An historical market price series (or perhaps index[15]) that recycling market buyers and sellers both know cannot be manipulated by any individual player in the recycling industry is necessary for financial hedges to gain widespread acceptance and use. Otherwise both providers and users of financial hedges will remain fearful that one or the other might manipulate whatever price series they have agreed to use as the basis for defining the price risk being hedged.

E. Material Grade Definitions & Specifications

NYSORMD and CWC undertook lead roles in developing recovered material grade definitions and quality specifications for the Exchange, with NRC organizing some of the industry group meetings and ultimately coordinating the project. Several recycling markets and/or industry associations already had established standards -- for example, ISRI's Guidelines for Paper Stock, for Ferrous Scrap and for Nonferrous Scrap have in the past and currently continue to be widely used by traders to define the grade being shipped. Various trade and governmental organizations that collect and report market price information also use ISRI specifications. The Project Partners attempted to coordinate with, clarify, or work with these standards where appropriate. Thus, the CBOT adopted ISRI's paper stock grade definitions and specifications in whole for use on the Exchange once the Project Partners negotiated the legalities of doing so.

[15] A price index differs from a price series in that the former provides information, not on absolute market price levels, but only on the changes in those price levels over time.

In other cases, Project Partners determined that existing standards, such as for glass and plastic, were inadequate in some aspects (i.e., quality assurance and measurability). Project Partner staff reviewed these existing standards to select useful portions, remove non-essential specifications, and identify key "real" contaminants (e.g. ceramics in glass). The Project Partners did this out of their desire to adopt useful standards that would help open the market by providing precise grade definitions and quality specifications, while at the same time excluding unnecessary standards that might be a barrier to systematic adoption and use of recovered product definitions and specifications in the recycling marketplace.

For both glass and plastics the Project Partners facilitated a two-year process during which staff:

- Examined the technologies by which recovered materials are turned into manufactured products.
- Determined what sorts of contaminating materials would harm end product quality.
- Organized and conducted meetings with manufacturers regarding their recovered material quality requirements.
- Worked with manufacturers to develop draft conceptual standards.
- Reviewed draft standards with recovered material processors and revised conceptual standards as necessary.
- Held discussions with governmental agencies and others that would be responsible for educating waste generators and recycling collectors about how to prepare materials for recycling.
- Turned conceptual standards into numerical specifications where that was appropriate for particular grades of certain materials.

Glass

In the case of recovered glass the two-year process resulted in the Partners developing very specific grade definitions, with each grade's quality standards numerically defined in terms of:

- Physical size for cullet particles.
- Amount of visible moisture.
- Percent by weight content from each color of recovered glass.
- Percent by weight limits for contaminants from glass packaging (labels, plastic caps and plastic rings) and other organic material, ferrous metal, nonferrous metal, and other inorganic materials.
- Prohibited medical, toxic, and/or hazardous materials.

In comparison to ISRI's Container Glass Cullet Specifications, Project Partners staff defined additional grades of glass for trading on the Exchange, and made the specifications for each grade more precise. ISRI defines six grades while the Exchange's definition of terms used in posting and searching for recovered glass listed 20 grades. The Exchange included grades for fiberglass industry end uses and for construction aggregate, in addition to the processed and unprocessed cullet grades for glass container industry end use listed in ISRI specifications.

For each grade, ISRI specifies color mix, provides sometimes general and sometimes precise size specifications, and provides a general listing of contaminants. The CBOT Exchange provided

more precise numerical size specifications and numerical percent by weight limits for each type of contaminant.

Recovered glass is a low value material, typically selling for no more than $50 per ton prior to being processed into container glass cullet, with some grades even having a negative price some of the time in various regions of the US. Recovered glass, thus, tends to be sent to markets within a few hundred miles of the areas where it is collected for recycling. Many of these regional markets, especially for recovered glass used in manufacturing glass containers, have their own standards developed over the years by the few (sometimes only one) end use manufacturers that operate in the region. For this reason there probably is little need for a national centralized market for glass. As a result, the recovered glass specifications developed for the CBOT Exchange appear to have found little use elsewhere since the demise of the Exchange. The fact that glass postings on the Exchange never amounted to more than a handful suggests that the carefully developed specifications for recovered glass never saw much use while the Exchange was in operation either.

Plastics

In contrast to glass, the Project Partners did not develop numerical specifications for PET and HDPE materials. The belief of plastics industry representatives and Project Partner staff involved in developing material grade definitions and specifications for plastics was that end uses were not well enough defined and established by the mid-nineties to permit the Exchange to define quality specifications precisely. The risk in precise specifications was that too much specificity and tightness might exclude future trading in grades that could become important for as yet undeveloped manufacturing processes. Thus the use of the term "open specifications" in the Exchange's PET and HDPE buy parameter and sell listing definitions and data entry pages.

Still, the plastics grade definitions and specifications development process did lead the Exchange to adopt defined categories for form, grade, color and contamination type. These categories permitted the listing of processed plastic material such as washed and unwashed regrind (or flake) and pellets made from recovered PET or HDPE plastics, in addition to various grades of baled recovered PET or HDPE bottles. Project Partners staff and industry stakeholders believed that listing of grades for regrind and pellets produced by plastics reprocessors was an important step in developing the chain of markets necessary for recycling plastics.

For example, ISRI's Scrap Specifications Circular Guidelines for Plastic Scrap then and now only address baled plastic bottles. Lack of widely accepted grades for flake and pellet can cause inefficiencies in trading of recovered plastic materials. In their absence buyers and sellers of reprocessed plastics typically must spend time negotiating and defining material characteristics and quality before they can reach agreement on a deal.

The fact that 19 of the 47 buy parameter and sell listings for PET and HDPE posted on the Exchange at the end of 1999 were for regrind or pellets indicates the importance of grade definitions for regrind and pellets. Another 19 postings were for baled bottles, while 9 contained no grade information at all. In addition, the dirty flake and pellet specifications were eventually rolled into PET "Best Practices" guidelines and approved by APR, the Association of Postconsumer Plastic Recyclers.

Plastic News publishes market price data going back to 1989 or 1991, depending on grade and/or color, for clean regrind and pellets made from post-consumer recovered PET and from post-consumer recovered HDPE. This indicates the existence of well-established markets for regrind and pellets that pre-date the Exchange's launch. However the *Plastic News* price series do not go into specifics regarding properties of the "clean regrind" or of the "pellets" whose prices are reported.

Exchange Project Partners had hoped that transactions on the Exchange would help define specifications in terms of the most actively traded types of PET and HDPE, thus narrowing the "open specifications" down into popular grades like those listed in ISRI's scrap specifications for paper. This use of the Exchange for plastics "specifications discovery" may have limited the Exchange's potential for price discovery for recovered plastic commodities. Had Exchange users made a large enough number of successful trades in plastics to allow publication of average prices, the lack of precisely specified grades would have made it difficult for the CBOT to determine which transactions should be aggregated to compute averages. The CBOT would have been able to compute meaningful price averages for plastics only after enough time had passed following Exchange launch for these grades to arise from the specifications discovery process.

Rubber

Grade definitions and specifications for whole tires and tire sections, tire chips and shreds, tire derived fuel (TDF), and crumb (ground) rubber provide a fairly clear example of one category of recovered materials for which development and operation of the CBOT Recyclables Exchange motivated successful design and industry-wide acceptance and use of specifications. Shortly after Exchange launch, the Rubber Manufacturers Association's (RMA) Scrap Tire Management Council (STMC) got involved on behalf of the tire industry in developing specifications for recovered tire and rubber materials.

The STMC spearheaded the recovered tire and rubber specifications design process. This included pitching the crumb rubber standards idea to the American Society for Testing and Materials (ASTM). ASTM assigned it to their Committee on Recycled Rubber, which successfully developed the specifications and testing protocols used to determine particle size distribution, fiber content, metal wire content, non-rubber material content, carbon black content, moisture content, and ash content. In addition, STMC facilitated definition of terms for whole tires and tire sections, tire chips and shreds, and TDF. STMC completed the process by paying for the computer programming technical support needed to have these rubber industry approved specifications posted on the Exchange in January 1998 as four specific definitions sheets. At the same time, the CBOT did not post the ASTM testing protocols on the Exchange due to ASTM's copyright control of those protocols.

Developments since January 1998 include STMC's current work through ASTM to design specifications for TDF, completion of ASTM specifications for using tire chips and shreds in civil engineering applications, and current negotiations with ASTM to explore the possibility for posting ASTM specifications on e-commerce sites that might offer trading in recovered tire materials. The CBOT Exchange provided the general impetus for development of recovered tire material specifications and testing protocols, but that use has turned out to be just the first in an increasing number of applications in the scrap tire recycling industry.

F. Material Quality Testing Protocols and Transaction Dispute Resolution

The Project Partners went to some effort to develop material quality testing procedures and to arrange for the availability of binding arbitration through arbitrators trained by the American Arbitration Association (AAA) should a dispute arise between members over a trade which the members had agreed to record. The Project Partners developed quality testing procedures for glass, paper and HDPE-PET, while STMC in conjunction with ASTM developed testing protocols for recovered tires and rubber.

Providing arbitration services for disputes between trading partners was not a new concept. For example, ISRI has long provided an arbitration service for its members to use to resolve trading disputes. Apparently ISRI's arbitration services have hardly ever been used, because costs for the arbitration process in relation to the value of the shipment of recovered materials under dispute almost always motivate one side or the other to back off and accept a compromise. Thus, it is not surprising to find that members of the Exchange never requested arbitration services, or used the available network of independent certified testing laboratories.

The Project Partners developed very elaborate testing procedures for paper, glass and plastics. These procedures are exceedingly complex and potentially very costly, especially in relation to the value of the recovered materials for which they are to be used. At the same time, the tire industry has generally accepted the testing protocols developed for recovered tires and rubber by ASTM in conjunction with STMC. These testing procedures are also somewhat complex and very precise. It will probably take additional experience with electronic trading of recovered materials, especially between unacquainted trading partners, to actually determine whether extensively detailed material quality testing protocols will need to be called upon to resolve disputes that arise following delivery of a shipment or to provide quality assurance prior to parties who are strangers even being able to make a deal. As the following chapter on e-commerce in the recycling marketplace indicates, there may be ways of communicating information about the reliability of potential trading partners that could provide the same assurances that would come from physically inspecting and testing the material to be traded.

G. Key Findings on the Exchange vis-à-vis the Recycling Marketplace

The evaluation team's research into impacts of the CBOT Recyclables Exchange on the recycling marketplace yielded key findings that are summarized in this section.

Recycling Market Prices

- Buy and sell listings on the Exchange responded to trends and cycles in recycling market prices in a manner consistent with the hypothesis that members used the Exchange as a spot market of last resort. That is, when market prices went up and supply tightened, buyers went looking on the Exchange for sellers. When markets moved down and supply loosened, sellers went looking for buyers on the Exchange.
- Buy and sell listings for less well-established materials (e.g., mixed paper or HDPE) responded to market prices more strongly than did postings for more established materials (e.g., OCC or PET), reinforcing the hypothesis that buyers and sellers mainly used the Exchange as a spot market of last resort.
- Exchange transaction activity level and trade recordation never even got close to providing the amount of transaction price data necessary to generate material and region specific mar-

ket price averages. It is very unlikely that any system depending on voluntary transaction recordation could produce accurate market pricing information.

- Exchange transaction activity never achieved the critical mass necessary for it to have any direct or indirect impact on recycling market prices or on transaction costs and market access.
- Exchange transaction activity never evolved enough to motivate the CBOT to institute futures trading in recovered materials. As a result, the Exchange never tested the demand for futures trading or the impact of futures trading on recycling market price stability. However, discussions about the need for price hedging mechanisms, engendered in part by Project Partners efforts to develop and publicize the Exchange, probably did help educate the recycling industry about the use of financial hedges.

Recovered Material Quality and Reliability

- The Exchange engendered development of specifications and grades for crumb rubber and recovered plastic regrind and pellets and helped spawn their industry-wide acceptance and use.
- The concern of Project Partners for more grade specificity, even in the recovered paper industry where ISRI specifications have long been used, may yet prove to be prescient, especially considering some of the grading detail being developed on certain e-commerce sites, as discussed in the following chapter.
- The development of detailed testing protocols, especially for glass and paper, was probably unnecessary at such an early stage in the development of online trading in recovered materials. Custom and practice have such a strong hold in the paper and glass industries, and many of the materials have such low value compared to the costs of precise testing, that disputes are seldom resolved through formal means. At the same time, the CBOT and the other Project Partner agencies might have been able to mitigate some users' concerns about testing protocols by assuring users that these protocols, as well as the detailed specifications that could be used in buy and sell listings, were optional and not mandatory for use in listings, transactions, and dispute resolution.

Recycling Market Functionality

- Although the Exchange did little to directly improve market access or liquidity, it did help blaze the trail and illuminate some of the dead ends in electronic trading of recovered materials. As discussion in the next two chapters indicates, e-commerce does hold potential for broadening and deepening recycling markets to such an extent that access for any buyer or seller is only a click away.
- The Exchange's experiment with allowing open access to its Internet site, making sellers passive participants, and having all trades negotiated offline, provide evidence for the hypothesis that trading needs to be fully functional online and that buyers and sellers need to be somehow screened and motivated to be serious participants.

VIII. The CBOT Exchange and E-Commerce

During and since the time of the launch of the CBOT Recyclables Exchange in 1995 and its conversion to an Internet platform in 1996, a number of other sites opened on the Internet for trading recovered materials.[16] Some of these sites are stand alone operations, while others also offer trading in other materials, such as finished paper or prime steel products, and/or offer other services, such as market trading and price information or shipping logistics and cost information. This chapter provides a review and comparison of many of these sites, including the CBOT Exchange, in terms of site operational characteristics and service offerings.

A. Sites Reviewed

The evaluation team investigated twenty-nine Internet sites, twenty-seven of which were completely operational at the time in mid-2000 when the evaluation team logged in to the sites.[17] The following list identifies the address on the worldwide web for each operational site, with year of launch on the Internet shown in parentheses whenever that information was available:

- aluminium.com (2000)
- cbot-recycle.com (1996)
- ciwmb.ca.gov/calmax
- ebay.com
- efibre.com
- e-steel.com (1999)
- enrononline.com (1999)
- fibermarket.com (1999)
- fmp.plasticsmarkets.com
- fobpaper.com (2000)
- grn.com
- j-src.com
- metalsite.net (1999)
- metrokc.gov/hazwaste/imex
- omgroup.com/pulpex (1997)
- paperdeals.com
- paperexchange.com(1998)
- paperloop.com (1999)
- pulpandpaper.net
- recycle.net/recycle (1995)
- scrapsite.net (2000)
- sec-mat.com (2000)

[16] New sites continue to appear or announce their imminent appearance on the Internet even as this report is finalized. For example, Georgia Pacific, International Paper, Louisiana Pacific, Weyerhaeuser, and Willamette have announced they will soon launch ForestExpress, which is promoted to become the largest recovered paper site. Another site currently in the testing phase is e-Cycled.com supported by Fibres International and promoted as a multi-material recycling site that will provide instant sales ability for recyclers, as well as managing transportation and providing payment.

[17] Several other sites were looked at, but are not included here mainly because they currently serve a market outside of North America -- e.g., e-cycle.com, a reuse and environmental awareness site that serves Hong Kong, and paperx.com, a European exchange for finished paper products.

- sefex.com (1995)
- thefiberexchange.com (2000) (also available at e-fiber.com)
- tnrcc.state.tx.us/exec/oppr/renew
- weavexx.com
- wastemanagement.com/recycle (1999)

B. Sites Not Trading Recovered Materials

Nine of the sites reviewed do not actually trade in recovered materials. At the same time, some of them do provide information or services directly or indirectly useful and/or of interest to buyers and sellers of recovered materials. This section of the report provides a brief description of each of these sites with an emphasis on attributes that may be relevant to e-commerce in recovered materials.

1. e-Steel.com is a restricted access online exchange that facilitates buying and selling of a wide range of steel products including prime and non-prime hot rolled, cold rolled and coated sheet, plate, tin mill, and rebar, as well as other product areas soon to be added such as pipe and tube, wire rod, and structural steel products. Sellers post products or services on e-Steel's site and buyers post inquiries. e-Steel is an independent provider of a venue for buyers and sellers to negotiate online and agree upon the terms of transactions. e-Steel does not set or endorse price, contract terms, quality, safety, conformance or legality of the products and services advertised or offered for sale; the ability of sellers to sell products or services or the ability of buyers to buy products or services.

e-Steel does not create pricing transparency. Online negotiations and transactions between trading partners are kept private and secure. At the same time, if they so desire, buyers or sellers can post public prices for all members to view.

The site does not control whether sellers will complete the sale of products or services they offer. The site is not responsible with respect to payment or collection for orders made and bids placed on the site. Claims continue to be handled between companies. However, all trades are fully documented on the site's system, facilitating discovery in case of conflict. The site strictly monitors rules, and in case of misuse penalizes offending members.

There are no membership or application fees for e-Steel. However, steel industry buyers and suppliers are the only applicants given access to the online exchange and other trading services provided on the site. E-Steel charges sellers a transaction fee of 0.875%. Buyers pay no fees.

Integration and linking capabilities available to site members provide many trading enhancements. For example, sellers can determine, at their sole discretion, which buyers are authorized to do business with them, which buyers can view their products and services, and which buyers may bid on or place orders for their products and services. Sellers can also offer the same product or availability to different customers on different terms. Buyers can send inquiries to one supplier, several preferred suppliers, or a universe of potential suppliers. The site also provides integration between itself and buyers' and sellers' existing internal systems, allowing, for example, mass upload of products and requirements from a desktop PC in seconds.

As of late spring 2000 e-Steel had over 2,500 member companies representing 89 countries, including 159 steel mills and 244 major original equipment manufacturers (OEM). E-Steel has secured venture capital funding of just over $100 million.

2. Fobpaper.com provides paper buyers an online dynamic database of more than 50,000 products from more than 200 manufacturers and distributors. Users set up individual portfolios, obtain price quotes, order products, find paper specifications, and analyze sourcing options. Registration requires credit, banking and trade information and references. There is no fee for registration. Registered users purchase paper products online. Paper with recycled content is available through the site.

3. Grn.com, the Global Recycling Network, bills itself as the Internet's Recycling Portal, a general information site for the recycling industry. Besides news and information, the site provides web-publishing services, catalogs, stock quotes, commodity prices and advertising for recycling industry companies. National average commodity prices for various grades of recovered metals, plastics, paper and glass are available at no fee to site users through Recycling Manager from American Metal Market. GRN updates these prices biweekly. Recycling Manager also offers prices for 17 major regions of the US for a fee. The site provides monthly updated recycling prices for Texas at no fee on the site, under auspices of the TNRCC Recycling Market Development Program. GRN operated the CBOT Recyclables Exchange site.

4. MetalSite.net began as an online seller of off-grade slab and flat rolled steel products on behalf of major steel producers, including Weirton, LTV and Steel Dynamics. It since has moved into prime products and secured equity investments from Bethlehem Steel and Ryerson-Tull, two other big steel industry players. 40 sellers now offer prime and non-prime steel products on the site and 7,000 users have been registered. The site provides sellers with both auction and online exchange capabilities. Buyers can enter requirements and the site responds with a listing of all products that match those specifications. Buyers can also post a request for quotes (RFQ).

MetalSite takes no stance with respect to claims by buyers on goods they have purchased. Those issues must be handled between an individual buyer and the seller.

MetalSite is free to buyers, except that the soon to be available RFQ service will charge a commission between 0.25 and 1.0 percent on completed transactions. Otherwise, MetalSite earns revenue three ways - transaction fees between 0.25 and 2.0% charged to sellers for each online sell, development and consulting fees for mini-web sites in the Market Center that the site offers manufacturers and vendors, and advertising fees for banner and other type of ads showcased throughout the site.

Buyers cannot view bids placed by other buyers. Buyers must obtain purchase authorization and credit approval from individual sellers before they can view and bid on that seller's auction offerings. When the site was first activated, buyers could not even view product listings from sellers from whom they had not obtained credit authorization. The site has since switched, or will soon switch, to having an open catalog of product and set price offerings by buyers.

MetalSite claims to be handling more than 5,000 transactions each month, with the average transaction in the $10,000 to $30,000 range. The issue of MetalSite's independence from steel producers may have been mitigated somewhat in December 1999 when the business-to-business investment fund Internet Capital group bought Weirton's 44% stake in MetalSite for $180 million in cash and stock.

MetalSite has spawned an offspring ScrapSite.net, which is just beginning to trade online in scrap metals and is included in the list of recyclables trading sites analyzed in this report.

5. Omgroup/pulpex is the information site for PULPEX, a futures and options contracts market based on the virgin wood pulp grade Northern Bleached Softwood Kraft (NBSK). Since May 1997 OM Gruppen AB, Stockholm, has provided trading and clearing in NBSK futures contracts to respective members and customers of the OM London Exchange or the OM Stockholm Exchange. PULPEX NBSK contracts are also offered at EnronOnline beginning October 1999.

PULPEX futures contracts have traded at daily volumes of over 7000 tons, but in the second quarter of 2000 traded at lower levels of less than 2500 tons. According to one knowledgeable source on futures markets, when the market in pulp futures gets too thin traders are concerned that they cannot easily enter or exit the market without significant price movements in response to large trades. This is a concern for large volume hedgers who cannot get out of a hedge position of any significant size in a thin market without incurring significant costs in time or dollars.

6. PaperDeals.com is an auction site for both buyers and sellers for overstocks of all categories of commercial printing papers. Site registration is free, but open only to bonafide buyers or sellers located anywhere in the world, including paper manufacturers, merchants (distributors), converters, brokers, import/exporters, commercial printers and major publishers. Sellers pay a fee upon completion of a successful auction based on a decreasing, sliding scale commission from 5% to 1%, with a $49 minimum.

Buyer and seller anonymity is preserved until completion of a successful auction, at which time the auction initiator is notified of the winning bid and bidder identification. The site is not responsible for payment or delivery of goods. If problems occur in consummating a transaction, PaperDeals.com will investigate and immediately suspend offenders.

The site had no open auctions as of late spring 2000. Nearly 300 sell and 25 buy auctions were reported as closed during the period from mid-September 1999 through mid-May 2000.

7. Paperloop.com is intended to serve as a source of information and business exchange for the paper, printing and converting industries, and to become the essential daily tool for paper, printing and converting managers around the world. The site claims that its on-line component can be customized to meet any company's specific needs. Users are supposed to be able to search exclusive pricing databases; buy, sell, deliver and track goods anywhere globally; track products in real time; automate traditional back-office operations; finance transactions; access 24/7 customer service; access auction facilities; utilize electronic RFP and RFQ services; have recourse for faulty sales; access updated buyer's guides, fact books, and directories; utilize a robust search engine; and perform secure transactions.

Paperloop.com has announced a strategic partnership with eFibre.com, a site that is covered later in this chapter. The site also profiles its Digital Marketplace which, when implemented, will allow users to buy and sell raw materials, paper and services throughout the paper value chain.

Presently the site provides only information services, including pricing for certain finished products such as newsprint, as well as online publication of two Miller Freeman publications, *Pulp & Paper Magazine* and *Pulp & Paper International*. The pricing information is referenced to another Miller Freeman publication, *Pulp & Paper Week*. Full site access is available only on a subscription basis. Subscribers to certain Miller Freeman paper industry publications are provided access at no additional charge.

8. Pulpandpaper.net is a pulp and paper industry resource site, with news, event listings, product and supplier directories, job listings, and links to related sites. The site charges no fees to users. However, access to the site's online industry news service and/or Walden report, which includes pricing information for certain pulp and paper grades, is available only upon payment of subscription fees. The site claims to have nearly 500,000 hits per month, and has developed strategic alliances with publishers and news services, including Dow Jones Newswires.

9. Weavexx.com provides the forming fabrics, press felts, dryer fabrics, and wet-end drainage equipment for all grades of paper and machine types. Weavexx Company's site provides a venue for their customers to order online.

C. Functionality of Sites Trading Recovered Materials

The eighteen websites listed in Section A that do trade in recovered and/or reusable materials use a variety of market mechanisms or trading functionalities to connect buyers with sellers. As indicated in Table 7, eight (44%) of the sites use some form of bulletin board listing for offers to buy and/or sell materials. The bulletin board was the trading mechanism employed on the CBOT Exchange, and in its most basic form consists of an online system for entering offers to buy or sell and a system to query and view the universe of current listings.

Bulletin board sites are passive facilitators for trading in the sense that contacts and negotiations are the responsibility of site users/members. Users/members must peruse listings, either to find a counterparty for their own offer or just to find an offer of interest, and then make contact and negotiate a trade.

One of the sites classified as a bulletin board in Table 7, California Recycled Plastics Markets at fmp.plasticsmarkets.com, is basically a referral service that provides a list of potential buyers and/or sellers to any member. That site also allows any member to submit a description of the type of material they wish to buy or sell. Fmp.plasticsmarket.com does not lend itself to listing of offers to buy or sell specific amounts of an identified grade of recovered plastics at a specified location and date.

Furthermore, one of the sites that the evaluation team included in its count of eight bulletin board sites is not primarily a bulletin board. ScrapSite provides seller's auctions and is also an online exchange, as well as offering online catalogs (the bulletin board function of the site) of products

from sellers. ScrapSite is an online exchange in the sense that it facilitates online negotiations between buyers and sellers until the parties reach agreement online on terms for a successful trade.

Another of the bulletin board sites, SEC-MAT indicates that it intends to facilitate trading by being an active market maker. SEC-MAT is a very new site with few listings, but it appears that the site's own traders will buy and sell materials as a way to facilitate transactions. This helps achieve the site's stated purpose of establishing a physical clearinghouse for secondary or recyclable commodities, by-products, used and surplus items or materials.

Table 7
Recovered Materials Trading Functionality and Transaction Types

Website Address	Bulletin Board		Auction		On-line	Active Market Maker: Own Account		Active Market Maker: Brokerage		Transaction Types			
	Sellers	Buyers	Sellers	Buyers	Exchng	Sell	Buy	Sell	Buy	Spot	Multi-Period	Futures	Derivatives
aluminium.com					x					x			
cbot-recycle.com	x	x								x			
ciwmb.ca.gov/calmax	x	x								x	x		
ebay.com			x							x			
efibre.com			x							x			
EnronOnline.com						x	x						x
fibermarket.com					x					x	x		
fmp.plasticsmarkets.com	x	x								x	x		
j-src.com							x			x			
metrokc.gov/hazwaste/imex	x	x								x	x		
PaperExchange.com			x	x	x					x	x		
recycle.net/recycle	x	x								x			
ScrapSite.net	x		x		x					x			
sec-mat.com	x	x					x			x			
sefex.com								x[1]	x[1]	x			
thefiberexchange.com			x	x	x					x			
tnrcc.state.tx.us/exec/oppr/renew	x	x								x	x		
wastemanagement.com/recycle						x	x	x	x	x			

[1]Online listing of buy and sell offers suspended December 1999.

Five (28%) of the sites - aluminium.com, fibermarket.com, PaperExchange.com, ScrapSite, and TheFiberExchange -- are online exchanges. After considerable discussion with site operators and others, the evaluation team chose that term to describe sites that provide an active, online mechanism for negotiating terms of a transaction between buyer and seller.[18] PaperExchange.com also provides an auction format for buyers (also known as a "reverse auction") wishing to use that method, rather than bilateral negotiations with sellers, for finding the cheapest price.

[18] Other possible terminology included e-commerce-enabled marketplace and B2B electronic marketplace.

Two (12%) of the sites, eBay and eFibre.com, provide trading facilitation exclusively through seller's auctions. TheFiberExchange offers private auctions where identities of parties are disclosed to each other and bidders are pre-approved prior to online negotiations.

The remaining four sites -- EnronOnline, Jefferson-Smurfit Recycling Corporation at j-src.com, SEFEX and Waste Management -- are active market makers through trading in materials on their own account or brokering trading between buyers and sellers. Enron and Waste Management both buy and sell, while Smurfit Recycling appears to concentrate on the buy side. Waste Management also acts as a pure brokerage in that it arranges trades without taking a position in the transfer of ownership of the physical goods being traded. SEFEX uses its in-house brokers to negotiate transactions between buyers and sellers who have posted potentially matching offers. Prior to suspension in late 1999 of online listing of buy and sell offers, SEFEX provided personal assistance from traders who actively searched listings to match buyers with sellers. Upon finding a potential match, traders would negotiate offline for transaction terms satisfactory to both parties.

Table 7 also indicates the type of transactions handled through each website. All but one of the sites are spot markets for physical goods, i.e., they facilitate transactions between buyers and sellers for immediate transfer of physical ownership and possession of recovered materials. In such markets, transportation modalities and costs are often critical considerations in reaching agreement on terms of the trade. Thus, as will be discussed below, some sites offer transportation logistics and cost estimation services to assist with deal making.

EnronOnline is the one site that does not deal in physical markets for recovered materials, instead offering trading in derivatives. For example, in May 2000 the site offered swaps in OCC and ONP (#8) that would allow buyers to peg their price at a guaranteed ceiling and sellers to peg their price at a guaranteed floor for the six month period May through October. At one point during May those swaps were being priced such that OCC or ONP sellers (e.g., a MRF) would have their selling price pegged at $110 or $90 per ton, respectively. OCC or ONP buyers (e.g., a recycled-content paper or paperboard mill) would have their buying price pegged at $120 or $105 per ton, respectively.[19]

Finally, one of the trading enhancements offered by fibermarket.com is facilitation of trades involving multi-period commitments to purchase or supply recovered materials. PaperExchange.com offers the possibility of future-dated transactions, but does not appear to facilitate the scheduling of multi-period transactions and order fulfillment that fibermarket.com does.

D. Types of Materials Traded and Price Transparency

Table 8 lists the type of materials traded on each website. Three of the sites surveyed are representative of industrial material waste exchanges offered by governmental agencies in a variety of jurisdictions across North America. The three shown in Table 8 are CALMAX, the California Materials Exchange at ciwmb.ca.gov/calmax, sponsored by the California Integrated Waste

[19] This pegging works perfectly in practice for buyers and sellers if they can move goods at prices that exactly match, or beat on the appropriate side, prices in the price series used to determine OCC and ONP prices for settlement of the swap contracts each month. The EnronOnline swaps are indexed on prices in *World Recovered Paper Monitor*.

Management Board; IMEX, the Industrial Materials Exchange at metrokc.gov/hazwaste/imex, sponsored by local governments and agencies in King County, WA; and RENEW, the Resource Exchange Network for Eliminating Waste at tnrcc.state.tx.us/exec/oppr/renew, sponsored by the Texas Natural Resources Conservation Commission. These industrial waste exchanges typically began as printed catalogs listing available and wanted quantities of a variety of non-hazardous and hazardous waste materials generated by commercial enterprises, and now use both catalogs and Internet bulletin boards to facilitate trading.

Another four sites -- the CBOT Exchange, Smurfit Recycling, Recycler's World, and Waste Management -- provide or, in the case of the CBOT Exchange, provided trading in all the customary post-consumer household recyclables, i.e., paper (mixed paper, ONP and OCC), plastic bottles (PET and HDPE), metal cans (aluminum and tin-plated steel) and glass containers, as well as typical business generated recyclables such as office paper, white ledger and computer printout. SEC-MAT also deals in a broad range of recovered materials, but appears to intend to concentrate on commercially generated recyclables other than the types of recyclables generated by households.

Table 8
Materials Traded and Price Transparency

	Post-Consumer Recyclables						Post		Recycld Price Discovery				
Website Address	Paper	Plastic	Metal	Glass	Rubber	Other	Industrial	New Goods	Gen	Spec	View List	RealTime Bid/Ask	RealTime Last
aluminium.com			x				x	x			x		x
cbot-recycle.com	x	x	x	x	x	x					x		
ciwmb.ca.gov/calmax							x				x		
ebay.com						x						x	x
efibre.com							x	x				x	x
EnronOnline.com	x							x			x	x	
fibermarket.com	x									x	x		x[2]
fmp.plasticsmarkets.com		x											
j-src.com	x	x	x	x			x						
metrokc.gov/hazwaste/imex							x				x		
PaperExchange.com	x						x	x			x	x	x
recycle.net/recycle	x	x	x	x	x	x			x	x[1]	x		
ScrapSite.net			x				x		x		x		
sec-mat.com		x	x	x		x	x				x		
sefex.com	x								x	x	x		
thefiberexchange.com	x						x	x			x	x	
tnrcc.state.tx.us/exec/oppr/renew							x				x		
wastemanagement.com/recycle	x	x	x	x		x	x		x	?			

[1]Historical price series available for $25 monthly for each of 11 categories of specific recovered materials.
[2]Fibermarket.com regularly updates price averages for specific materials with recent transaction prices.

Six sites -- eFibre.com, EnronOnline, fibermarket.com, PaperExchange.com, SEFEX, and The-FiberExchange -- provide trading of recovered materials only for pre- or post-consumer paper commodities or paper commodity derivative instruments. Two sites, aluminium.com and Scrap-

Site, provides for trading only in scrap metals, aluminum and ferrous scrap respectively. Another site, fmp.plasticsmarkets.com, facilitates trading only in recovered plastics, primarily PET and HDPE bottles generated under California's bottle bill.

The remaining site listed in Table 8, eBay, deals mainly in reusable consumer goods, such as used electronics, clothing and cars.

Table 8 also categorizes the types of price disclosure provided on Internet sites for trading recovered materials, and indicates which sites provide which types of price disclosure. As Table 8 shows, disclosure of pricing information most often occurs through user/member perusal of buy and sell listings. All bulletin board and online exchange sites provide user/member access to buy and sell listings. Provided that the posting contains an ask or bid price, provided that the postings are somehow dated or kept current, and provided that there are sufficient postings for the recovered material of interest, users are able to determine current bid and ask prices for a given commodity. Members of EnronOnline also can peruse offerings and Enron's current bid and ask prices for each commodity or derivative.

Four of the five auction sites offer real time updates to bid and ask prices as auctions proceed, and disclose the winning bid. The fifth auction site, ScrapSite, is too new to have active listings that would indicate how auction price disclosure will occur. Presumably it will also offer real time tracking of auction bids as its parent MetalSite does.

Despite suspension of online trading, SEFEX continues to provide a weekly paper market commentary and biweekly, regional price tracking for numerous grades of recovered paper, including mixed, ONP (#6 and #8), OCC, sorted office paper, white ledger, and CPO. Fibermarket.com also apparently offers near real time price tracking for numerous recovered paper grades by providing real time updates to average prices for the most recent period, say 30 days, of trading.

Waste Management provides general commentary in a biweekly online newsletter with specific pricing references on HDPE, PET, aluminum, steel, fiber and the post industrial plastic and rubber commodities polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), and styrene butadiene rubber (SBR). For a period of time in 1999 after the site was launched, the biweekly newsletter also carried tables of pricing by region for all the materials collected in the typical US curbside recycling program, as well as prices on other recovered materials.

Recycler's World provides general price indexes for eleven categories of recovered goods -- post-consumer recyclables, computer & electronics, automotive, scrap metals, waste paper, textile fibers, plastic, wood, tire and rubber, crumb rubber, and scrap glass. Recycler's World claims to update this index daily. However, when the evaluation team viewed the eleven indices at two different points in time ten days apart in late spring 2000 none had changed. For specific materials in each category, the site offers historical price series at a cost of $25 for each monthly update for each category.

E. Quality Assurance

One of the major concerns of Project Partners in establishing the CBOT Recyclables Exchange was how to insure that buyers and sellers could make online, sight unseen transactions in materials, many of which had no clearly defined, consistent physical characteristics. Table 9 summarizes the means by which online sites for trading recovered materials have addressed this issue through grade definitions and quality assurance procedures for buyers. Some sites also provide payment assurance procedures for sellers.

Table 9
Recovered Materials Quality Assurance

		Counterparty		Specifications			Material	Dispute
Website Address	Transact Online	Identity Online	Member Comments	ISRI Grades	Other Gen	Other Det	Testing Available	Resolution Available
aluminium.com	yes					x		
cbot-recycle.com	no			x		x	x	x
ciwmb.ca.gov/calmax	no	x						
ebay.com	yes		x					x[1]
efibre.com	yes					x	x[2]	
EnronOnline.com	no			x				
fibermarket.com	yes			x				
fmp.plasticsmarkets.com	no	x						
j-src.com	no			x				
metrokc.gov/hazwaste/imex	no	x						
PaperExchange.com	yes			x		x[3]	x[4]	x[4]
recycle.net/recycle	no					x		
ScrapSite.net	yes	x	x	x				
sec-mat.com	no					x		
sefex.com	no			x				
thefiberexchange.com	yes	x[6]		x		x	x[7]	
tnrcc.state.tx.us/exec/oppr/renew	no	x						
wastemanagement.com/recycle	no				x		x[5]	

[1]Insurance against non-performance and fraud provided free to buyer members subject to a $25 deductible and certain conditions, such as the buyer being an eBay member in good standing. For transactions above $200, an online escrow service is available for a fee. Online dispute resolution is also available.

[2]Winning auction bidder has 24 hours to request a sample and 48 hours after sample receipt to decide whether to withdraw winning bid.

[3]Provides detailed producer specifications "filters" on buy/sell search screen for paper products.

[4]Has allied with SGS to provide online quality verification services to site members, and to support the site's forthcoming dispute resolution service.

[5]Typically requires a sample before concluding any transaction.

[6]Identities revealed for private auctions only.

[7]Buyers can get sample and cancel if sample is unsatisfactory.

Four of the sites - the three local government waste exchanges and the California plastics markets referral site, fmp.plasticsmarkets.com, provide no online material specifications other than those listed in the postings, and no online quality or payment assurance services at all. However, these four sites do provide completely open disclosure of identity and contact information for all

postings on their sites.[20] With this contact information it's "caveat emptor" for buyers and "show me the money" for sellers.

The other two sites that provide disclosure of buyer or seller identities are ScrapSite and TheFiberExchange. ScrapSite is so new that there are no listings to actually check out. But trading information on the site suggests that sellers are identified with the products they offer, and buyers have to have credit approval from a seller before that buyer can bid on their products, either through the catalog or an auction. TheFiberExchange discloses identities only in private auctions.

The remaining twelve sites keep buyer and seller identities confidential until a transaction has been finalized or until a preliminary screening indicates that there is some potential for negotiating a trade. Four of the auction sites, as well as aluminium.com and fibermarket.com, provide a site format that facilitates completion of a deal online. These six sites use a variety of quality assurance procedures:

- Aluminium.com has a screening committee to verify that all applicants are legitimate aluminum traders.
- Through Lloyds, eBay provides buyers in good standing[21] with free insurance against nonperformance and fraud for transactions up to $200. For higher value transactions an online escrow service is available for a fee. The site also provides ratings and comments on sellers based on seller performance in previous auctions.
- eFibre.com allows winning auction bidders to obtain samples and withdraw a winning bid within 48 hours after sample receipt.
- Fibermarket.com uses ISRI's well understood and used recovered paper stock specifications as the means to assist buyers and sellers know what they are trading.
- PaperExchange.com uses ISRI's paper stock specifications and, in addition, has recently announced an alliance with a well-established quality verification services provider to support the site's forthcoming online material testing and dispute resolution services.
- ScrapSite uses ISRI's specifications for ferrous and nonferrous scrap and scrap seller brandnames to provide quality assurance.

Eight of these twelve sites, including the CBOT Exchange when it was in operation, depend on buyer vigilance, reinforced by well-known and/or reasonably well-defined material specifications or evidence from physical samples, to assure that buyers get what they believe they paid for. Some sites among the eighteen, e.g., aluminium.com and PaperExchange.com, also provide buyer credit worthiness assurance by screening buyers wishing to have the site rate them as a good credit risk and/or provide payment to sellers on a buyer's behalf. In addition, PaperExchange.com now requires a Dun and Bradstreet rating on all new members, and is attempting to get this information on all existing members as well.

Finally, in terms of dispute resolution, the CBOT Exchange offered that service through independent arbitrators trained by the AAA to resolve issues. The service was only available for

[20] These sites provide no other means for contact between buyers and sellers other than the contacts initiated by one party or the other, so full contact information is a necessity for the sites to operate.
[21] In this case, good standing means, among other things, that the buyer has always paid sellers whenever the buyer won an eBay auction in the past.

transactions that were registered with the Exchange. The only site listed in Table 9 that actually has dispute resolution services currently available is eBay, which offers online dispute resolution, currently for free, through Square Trade, an independent third party not affiliated with eBay.

F. Trading Access/Registration and Cost

As Table 10 shows, seventeen of the eighteen sites require some form of registration. Recycler's World does not, but does check that users posting buy or sell offers have a valid e-mail address and contact information.

Table 10
Website Access and Cost

Website Address	Registration Required	Registration Restricted	Registration Fee	Use/Transaction Fees
aluminium.com	x	x	$0	scrap buyers: 1% fee
cbot-recycle.com	x		$10	$2/sell listing;$0.50/match delivered
ciwmb.ca.gov/calmax	x		$0	none
ebay.com	x		$0	sellers:$0.25-$2/item & 1.25% -5% commission
efibre.com	x		$200/yr	1% commission both buyer & seller
EnronOnline.com	x	x	$0	none
fibermarket.com	x	x	$0	minimum $100/month
fmp.plasticsmarkets.com	x		$0	none
j-src.com	x	implicit	$0	none
metrokc.gov/hazwaste/imex	x		$0	none
PaperExchange.com	x	x	$0	3% sellers commission
recycle.net/recycle			$0	$200 minimum for more than 5 listings
ScrapSite.net	x	x	$0	0.25% - 2% sellers commission
sec-mat.com	x	x	$0	?
sefex.com	x	x	$49/mnth	possible brokerage fees
thefiberexchange.com	x	x	$?/mnth[1]	none
tnrcc.state.tx.us/exec/oppr/renew	x		$0	none
wastemanagement.com/recycle	x	implicit	$0	none

[1]Monthly fee $49.95 for non-traders and between $99.95and $5,000 depending on quarterly trading volume for traders.

Eight of the sites -- aluminium.com, EnronOnline, fibermarket.com, PaperExchange.com, ScrapSite, SEC-MAT, SEFEX, and TheFiberExchange -- restrict registration for trading to bona fide buyers, suppliers and brokers. Two of the sites -- Smurfit Recycling and Waste Management -- have no formal registration restrictions. But to actually trade through either site a user would have to be a buyer, supplier, or broker. The other eight sites do not screen registrants.

Only four of the Internet sites have (or had) a registration fee. The CBOT Exchange one-time registration fee was $10. eFibre.com charges an annual fee of $200. SEFEX charges $49 per month. TheFiberExchange charges a monthly fee of $49.95 for non-trading members. That site charges between $99.95 and $5,000 per month for trading memberships, depending on the scale of quarterly trading volumes. Perhaps coincidentally, the CBOT Exchange is closed, eFibre.com had no active auctions for either virgin or recovered fiber as of early June 2000, SEFEX suspended online listing of buy and sell offers late in 1999, and TheFiberExchange is brand new.

Eight of the sites also charge no use or transaction fees. SEC-MAT and SEFEX may charge for successful transactions, but information available on those sites does not clearly indicate under what conditions or how much, if any, the usage charges may be.

Seven of the sites do charge a fee for postings and/or for completed transactions. The CBOT Exchange charged $2 per month for each sell listing and $0.50 for each match notice delivered to a buyer.

The retail auction site eBay charges sellers an insertion fee for each auction item, generally between $0.25 and $2. In addition, sellers pay a declining percentage commission of between 5% and 1.25% depending on the final auction price.

Aluminium.com charges buyers a 1% transaction fee, except for transactions in which the buyer or final destination is in Japan, Korea, China or Taiwan. In those cases the seller pays the 1% fee.

Both buyer and seller pay a 1% commission after a successful auction on eFibre.com. Fibermarket.com charges transaction fees and service fees according to site usage, with a minimum monthly charge of $100 for each member. PaperExchange.com charges sellers a commission of 3%. ScrapSite charges sellers a declining percentage commission between 2% and 0.25%.

Recycler's World charges a fee of at least $200 to users with more than five buy and/or sell listings.

G. Site Activity and/or Investment Levels

The proof of the pudding for online trading is in which sites are actually doing significant numbers of transactions through their sites. The three governmental agency bulletin board sites -- CALMAX, IMEX and RENEW -- all have a substantial number of buy and sell listings. Three of the other bulletin board sites - - the CBOT Exchange, California Recycled Plastics Markets, and Recycler's World -- also have, or had, significant postings. One interesting note on Recycler's World is that in late spring 2000 that site had under 35 buy or sell listings for mixed paper, ONP and OCC, compared with 148 for PET and 126 for HDPE. Recycler's World also counts over 1.8 million visitors to the site since it launched in 1995.

SEC-MAT and ScrapSite are so new that neither had any listings as of early June. The evaluation team was not been able to log on to aluminium.com.

eFibre.com had no active auctions listed in early June. PaperExchange.com had no buy or sell listings for mixed paper or ONP, only 3 listings for OCC, and 2 for sorted white ledger. Other ISRI paper grade listings on this site were not reviewed. PaperExchange.com's 4,000 plus membership may be more involved in trading finished paper products than recovered materials.

SEFEX has suspended online postings, but at one time claimed to have 250 brokers using their exchange. Smurfit Recycling and Waste Management do not provide online viewing of their listings. TheFiberExchange in early June had a buy request for mixed paper and a sell listing for ONP (#7), plus seven buy or sell listings for other grades of recovered paper.

EnronOnline offered two swaps in May, one for ONP and one for OCC, each for up to 250,000 tons per month over the May through October period, available in 10,000 ton increments.

Finally, in early June personnel at fibermarket.com indicated they had between 250 and 300 buyers and sellers registered on their site with 35,000 tons of recovered paper listed on the system, about half of which already had commitments for trading.

In terms of financing, Smurfit Recycling and Waste Management sites have the backing of those major corporations. ScrapSite presumably has the backing of some of the same major corporations in the steel industry that are backing MetalSite, as well as major scrap metal business organizations. The governmental bulletin boards have the backing of public agencies and California Recycled Plastics Markets is backed by the American Plastics Council (APC).

Their publicly traded parent RecycleNet Corporation backs Recycler's World and SEC-MAT. eBay is a publicly traded company with market capitalization recently worth over $19 billion. EnronOnline's trading in recovered paper derivatives is backed by Enron, and by the $50 billion in online transactions in a wide variety of commodities already consummated through EnronOnline.

PaperExchange.com has raised over $35 million in venture capital funding. Aluminium.com has raised a similar amount of funding. Fibermarket.com has reportedly raised close to $5 million to support its online site. Finally, eFibre.com has formed a strategic alliance with paperloop.com, Miller Freeman's website, which implies that eFibre.com has the backing of this firm which publishes many of the paper industry's most well-respected directories and periodicals.

IX. Conclusions

Online trading on a large scale in recovered materials -- spot, multi-period, futures, and derivatives -- is inevitable. At low volumes or for virgin/prime materials it's already happening. The CBOT Recyclables Exchange helped blaze the trail that will eventually lead to successful online trading of recovered materials. However, the CBOT Exchange's bulletin board, offline negotiations format appears to be a dead end, at least judging by several well-funded e-commerce sites that have recently emerged for trading, among other things, recovered paper and scrap metals.

At the same time, certain functionality questions remain largely unresolved. For example, will spot or multi-period trading dominate online transactions? Will the auction, online exchange, electronic brokerage, some other format, or a combination site be the main vehicle for online markets?

Several access and fee structure questions appear to be already resolved. For example, in its initial computer modem dial-up incarnation the CBOT Exchange charged a $1000 annual subscription fee. Five years later, no-charge access to recyclables trading dominates on Internet sites.

The CBOT Exchange's Internet site charged posting and matchup fees. Now, e-commerce sites favor fees on completed transactions and fees for supporting services such as escrow or buyer credit checks. In addition, some combination of site oversight on listing and trading activity, expiration dates on postings (e.g., auction closing dates), consistent trading activity, and member screening to assure serious users may keep buy and/or sell listings up to date. Out-of-date listings were endemic on the CBOT Recyclables Exchange.

Then there is a third category of site characteristics and functionality issues for which there are emerging, not yet irreversible, but already quite strong trends. One of the most important of these is whether end use buyers, collector/recycler sellers, middleman brokers, or virtually independent third parties will drive online trading. Another is will there be one-site shopping for recyclers? Or will online trading be segregated by material type, an exchange or two each for paper, metals, plastics, rubber, glass, textiles, and perhaps organic waste compost? Will there an additional set of separate sites for categories of miscellaneous and oddball materials, and/or for all the reusables and durables?

A. Recycling Needs Spot Markets, but Can Spot Markets Stand Alone?

Somewhat unintentionally, the CBOT Exchange evolved as a spot market. Virtually all the other Internet sites reviewed in this report are also spot markets with the exception of fibermarket.com. Despite the dead weight from out-of-date listings, the correlations between buy and sell postings to the Exchange and recycling market prices provide evidence that active users of the Exchange viewed it as a market of last resort. This was especially the case for materials such as mixed paper and HDPE plastics that have less well-established markets than other materials such as OCC and PET that have well established and long term ongoing market outlets. The number of miscellaneous material postings on the Exchange provides further evidence of the need for a spot market outlet of last resort.

Furthermore, even for the well-established materials like OCC and PET there are times when buyers or sellers miscalculate, or when unanticipated weather or manufacturing events occur. In these circumstances a liquid spot market can prevent or mitigate costly disruptions in the supply chain. In fact, a very liquid and reliable spot market could even reduce inventory requirements for end-use manufacturing.

The need for a centralized, liquid and readily accessible spot market for recovered materials, especially the harder to market commodities, seems indisputable. The main problem is that spot trading in recyclables, even if one online marketplace handled all of it, may not provide enough revenue to support an online market with the breadth of reach and availability of supporting services for quality and credit assurance necessary to ensure market liquidity throughout the recycling market's demand cycles. According to one knowledgeable source, spot market transactions in recovered paper account for only between 1% and 5% of total purchases.

That implies that online spot markets must be piggybacked onto other online markets. This report's review of current Internet sites for trading recovered materials suggest three intriguing possibilities:

- An online market for both spot and more established long-term sourcing commitments similar to fibermarket.com and, perhaps, Waste Management's recycling site.
- An online market for finished products (both virgin- and recycled-content) and for the recovered material inputs for the recycled-content products similar to PaperExchange.com and the MetalSite-ScrapSite duo, or, in the case of futures and derivatives, EnronOnline.
- An online spot market for both virgin and recovered materials similar to eFibre.com or, in the case of futures and derivatives, EnronOnline.

Which, if any, of these modalities might prevail is currently unknown. The only site for trading in physical goods among those just cited that is not restricted to one end-use industry, in particular either paper or ferrous metals, is Waste Management's site. Online trading does not occur on that site, while it does on all the others, and no other site has yet emerged to offer online trading in all types of recovered materials. This may have something to do with the difficulties of adapting one online trading format to a variety of end-use industries, each with its own historically developed and unique customary trading practices.

B. Recyclers May Need One-Site Shopping, but Do Buyers?

Currently, developments in Internet sites for trading paper and metals point toward sites segregated by end-use industry, a sort of closed loop market for closed loop recycling. As evidenced by the involvement of large-scale suppliers, brokers and end users in industry driven trading sites, this trend has brought the big players, both in paper and steel, into online trading. Their involvement contrasts sharply with that critical time after the CBOT Exchange's launch and then re-launch on the Internet, when large scale brokers and buyers sat on their hands, virtually dooming the Exchange, as evidenced by the remarks of interviewees and forum participants during 1996.

Yet segregation of trading by end-use industry raises issues of concern for underdeveloped markets in major categories of recovered materials such as plastics and rubber, and for local markets involving small scale, not-so-closed-loop enterprises that could be well served by diverse local

spot markets. For example, recovered plastics appear to have no closed loop end-use industry in which online trading of finished products or virgin materials might be used to piggyback trading in recovered materials. This is what appears to be happening to some extent through PaperExchange.com and eFibre.com in paper and MetalSite's offspring ScrapSite in metals.

An active, multi-material online market such as the CBOT Exchange had planned, and Recycler's World currently intends to be, might generate sufficient revenues from transactions in the high volume paper and metal materials to support development of specifications and markets necessary to spawn more liquid, widespread and readily accessible markets for recovered plastics. But up to now these multi-material bulletin board sites have not drawn in the large-scale buyers necessary for adequate revenue generation. The fact that bulletin boards can not generate commissions from completed transactions, because transactions are completed offline, compounds revenue generation issues for bulletin board sites.

C. Quality Assurance Procedures Are Critical for Online Trading

With respect to the need for quality assurance it is perhaps no coincidence that the sites furthest along towards achieving sustainable volumes of online trading in recovered materials are mainly in paper, with a promising new upstart in ferrous scrap. Both industries, paper and metals, have recycled materials for decades using ISRI's well understood and accepted grading specifications. There are grades such as mixed paper whose actual physical characteristics may vary quite widely from supplier to supplier or even truckload or bale to truckload or bale from the same supplier. But for the most part, buyers and sellers have fairly consistent understandings of what each ISRI grade means in terms of what the recovered materials will look like and how they will perform in manufacturing end products.

Thus, while some of the funding for specifications and testing procedures development by the Project Partners might have been better spent on development of the Internet platform or on Exchange promotion, this work had to be done at some time during the evolution on online trading. PET recyclers' acceptance of the CBOT Exchange's regrind and pellet specifications, and the rubber industry's acceptance of crumb rubber specifications developed under the leadership of STMC for the CBOT Exchange, were both necessary steps for eventual widespread online trading in those recovered materials.

Furthermore, at least one site, PaperExchange.com, has plans to introduce numerous refinements/subgrades for many of ISRI's Paper Stock grades. PaperExchange.com believes that these more detailed grades are needed to better match the characteristics of recovered paper grades that have emerged in current market transactions.

The evaluation team also notes that some sites may be ready to follow eBay's lead in allowing site users to post comments or in some way score the quality of materials they have purchased from sellers. Sites can even preserve seller's anonymity, but still provide access to comments/scores on the member offering each sell listing. This is a particularly effective method of quality control, especially for one-of-a-kind materials. It could prove very useful for difficult to grade materials such as mixed paper where the buyer has to depend heavily on seller's characterizations of the material.

D. Price Transparency Will Emerge as Online Trading Succeeds

Many interviewees, including large end-users such as a major North American paper and paperboard manufacturer, listed price discovery as one of the main reasons they used the CBOT Exchange. Further, some of these interviewees implied that they never intended to trade on the Exchange, but joined to get information on prices and recycling market movements.

Fortunately, most of the sites reviewed for this report appear to recognize this need, and some are already generating sufficient numbers of transactions for certain grades to provide average price data for broad geographic regions. In addition, the auction sites post winning auction bids for all members to see. Prospects are, thus, good for the institutionalization of price discovery, at least for members, on whichever sites may prevail in the current battle for online trading supremacy.

The evaluation team notes, however, that too many "Looky-Lous" will bog down a site's ability to provide credible price data. Numerous recorded transactions are what yields price averages that actually reflect market trends. At this point in time most sites are scrambling to attract members. But at some future time it may be necessary to screen out, or at least restrict information access for, those members that want to look but not play.

E. The Preferable Format for Online Trading Remains an Open Question

The passive, negotiate transactions offline, bulletin board format appears to be a dead end for electronic trading in paper and metals. The bulleting board may serve a transitional function for plastics, rubber and other less well-established recovered materials. It may always be around for oddball and one-of-a-kind recyclables or reusables. But because it kicks buyers and sellers back to the phone and fax to complete trades on their own volition, the bulletin board format fails to fully exploit the possibilities of e-commerce.

The online brokerages supplement the volition of buyers and sellers with a party motivated to close the deal, namely the broker. However, as currently formatted these sites do not really exploit the possibilities of e-commerce in any substantial way either.

By contrast, the auction sites and the online exchanges allow members to negotiate and close deals online. Sites such as fibermarket.com add the complexity of transacting through time, and thus open a significant new dimension of e-commerce functionality that draws even more substantially on the data management and complex communication capabilities of the Internet. It is still too early to predict which of these formats will be most beneficial, and hopefully for this reason prevail, for trading recovered materials. All appear to offer the possibility for price transparency, quality and credit assurance, maintenance of confidentiality for sensitive information (e.g., who got paid exactly what price by whom for what material in a specific deal), use of fair and fairly applied rules, and creation of robust and liquid recovered material markets.

F. Online Trading Solutions for Non-Closed Loop or Low-Priced Materials Are Still Problematic

While online trading in recovered paper and ferrous metals is well underway, even if the eventual trading format is uncertain, online trading in other recovered materials faces difficult barriers. Plastics and rubber lack the historical closed loop end uses enjoyed by paper and steel. Both also lack dominant and well-specified bulk grades around which online trading might coalesce.

Other materials such as glass and organic waste compost have market price levels that typically will not support shipping costs to distant markets. Online trading for these materials must reflect the local or regional nature of their markets.

Market thinness and lack of commonly accepted grades are significant barriers to any very active online trading in oddball or infrequently generated materials such as those that populated the CBOT Exchange's sell listings in the miscellaneous category. For the foreseeable future this type of material will likely be handled online only through "post and hope" bulletin board systems.

G. Futures Markets for Recovered Materials May Arrive Online in the Future, but Derivatives Trading Online Has Already Arrived

Futures trading in the virgin pulp grade northern bleached softwood Kraft (NBSK) has been available since mid-1997 to members and customers of the OM London and Stockholm Exchanges and since late 1999 through EnronOnline. In addition, PaperExchange.com announced in late May 2000 that their site soon will offer easy access to trading in these virgin pulp futures contracts.

Futures trading in virgin metals has been available for much longer. However, futures trading remains unavailable for recovered metals, recovered paper grades, or any other recovered material at present.

What has become available recently is trading in derivative instruments, particular examples of which were swaps for ONP and OCC offered through EnronOnline for the six-month period May through October 2000. The ONP swaps were quoted with a monthly per ton floor price guarantee of $90 and ceiling price guarantee of $105 in the middle of May, while the OCC swaps were quoted with a floor of $110 and a ceiling of $120. Enron apparently intends to continue offering financial hedges for recovered paper in transactions with recycling industry businesses and/or through additional customers that learn about these hedges through its website EnronOnline. Whether trading in derivatives and the availability of other types of financial hedges through a variety of private firms obviates the usefulness of futures markets in recovered paper remains an open question.