



State of Wisconsin Department of Administration Division of Energy

Business Programs: Market Assessment

Appendix: Commercial and
Industrial Equipment Supply
Chains: An assessment of the
HVAC industry

June 2003

Contractor: Energy Center of Wisconsin with Quantum Consulting



Report

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Appendix: Commercial and Industrial Equipment Supply Chains

An assessment of the HVAC industry

June 2003

Project managed by

Bobbi Tannenbaum, Energy Center of Wisconsin

Prepared by

Quantum Consulting

Berkeley, California

Prepared for



focus on energySM

The power is within you.

Energy Center of Wisconsin

595 Science Drive

Madison, WI 53711-1076

Phone: 608.238.4601

Fax: 608.238.8733

Email: ecw@ecw.org

www.ecw.org

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A.1 OVERVIEW

HVAC INDUSTRY ASSESSMENT . . . ATTACHMENT . . . OVERVIEW

DETAILED RESULTS FROM THE INTERVIEWS CONDUCTED DURING THIS ASSESSMENT, SUPPLEMENTED BY MATERIAL CONTAINED ON COMPANY WEB SITES, ARE PRESENTED IN THIS ATTACHMENT TO THE MAIN REPORT. NOTE THAT THIS DOCUMENT IS NOT THE MAIN REPORT FOR THIS STUDY.

Sixty-six HVAC industry market actors were interviewed in the Fall of 2002 to obtain market actor perceptions of the HVAC market structure, business practices, the role of energy efficiency in these practices, and possible ways of increasing the efficiency of HVAC systems in Wisconsin's C/I sector. Results are presented in the following order: industry observers, manufacturers, distributors, contractors and design engineers.

- Each section begins with an overview of the interviewees.
- Market actor business practices are then described, concentrating on distinguishing characteristics, including marketing practices and the degree to which they offer standardized versus custom solutions to meet their customers' needs.
- HVAC product flow is then discussed. Ancillary services offered by each market actor group and the way in which market actors remain current on HVAC industry developments are included in the discussion. A discussion of rural markets is included in the Manufacturers section. This topic is integrated in one section as all the market actors have similar methods for serving rural markets.
- Key aspects of the HVAC equipment selection process are then presented. Topics covered include market actor opinions on contracting arrangements, the key influencers of the HVAC purchase decision, the key decision makers themselves, and the equipment characteristics preferred in different types of HVAC installations.
- This is followed by a discussion of key market, technical and regulatory trends, and the role of energy efficiency in the business practices of each market actor group.

- Market actor insights as to the major obstacles to energy efficient purchases faced by end users and the supply chain and suggestions as to possible ways for overcoming these obstacles are then presented. Each section ends with any general suggestions each market actor group has for Business Programs services.

A.2 INDUSTRY OBSERVERS

INDUSTRY OBSERVERS . . . INTERVIEWEES

SIX INDUSTRY OBSERVERS WERE INTERVIEWED AT THE BEGINNING OF THE ASSESSMENT TO OBTAIN GENERAL INFORMATION ON INDUSTRY STRUCTURE AND TRENDS.

- Three air conditioning industry observer interviews were conducted in October 2002.
 - Air Conditioning Contractors of America (ACCA): VP of Research and Technology
 - National HVAC and Refrigeration Wholesalers Association (NHRWA): Chief Operating Officer
 - Air Conditioning & Refrigeration Institute (ARI): VP (from Phase I, ARI contacted to affirm findings)
- Three boiler industry observer interviews were conducted in November 2002. All three of these observers are representatives of national organizations; their observations are therefore more industry-wide than oriented specifically to Wisconsin. The interviewees were:
 - Steam Process Specialist, U.S. Department of Energy, Office of Industrial Technology (DOE/OIT): Works with boiler manufacturers and user associations to promote more efficient technologies and practices
 - President, American Boiler Manufacturers Association (ABMA): Association of boiler manufacturers and the companies who supply them, for products ranging in size from small boilers for dry cleaners to large utility boilers.
 - President, Council of Industrial Boiler Operators (CIBO): Represents the user community. “We’re the ones who tell suppliers what they need to provide.”
- In addition, the manager at the Consortium for Energy Efficiency (CEE) responsible for boiler-related programs was contacted; she provided access to estimates of the size of the boiler market in the context of a detailed study of the commercial market for condensing boilers. The President of CIBO also provided a link to a recent study of industrial boilers, which provides an estimate of the size and of the industrial boiler market.

INDUSTRY OBSERVERS . . . BUSINESS PRACTICES . . . DISTINGUISHING CHARACTERISTICS

ACCA TAKES A PROACTIVE ROLE ON ENERGY EFFICIENCY, AND MAY BE A GOOD FOCUS PROGRAM ALLY. THE OTHER ASSOCIATIONS INTERVIEWED ARE ACTIVE AS WELL, BUT, BASED ON THE INTERVIEWS AND WEB-SITE REVIEWS CONDUCTED, TO A SOMEWHAT LESSER EXTENT THAN ACCA.

- The association tries to encourage its contractors to be realistic in their expectations of growth and have a healthy focus on expanded profitability and not just market share. That means emphasizing energy efficiency, comfort and indoor air quality instead of just cost.
- ACCA noted that it has contractors who sell only on price as opposed to those who refuse to sell low-end. ACCA attempts to encourage its members to operate more like the latter.

INDUSTRY OBSERVERS . . . TRAINING

BOTH ACCA AND THE NHRWA ARE ACTIVE IN CONTRACTOR TRAINING, PROVIDING OPPORTUNITIES FOR THE FOCUS ON ENERGY TO LEVERAGE THESE INITIATIVES.

- According to ACCA, there are concerns about the supply of trained technicians; there has been a decline in the number of vocational/training programs and a real shortage of qualified technicians. ACCA has a certification program (NATE) that increases the overall level of knowledge, including energy efficiency.
 - They haven't yet made this a requirement of membership, but are going to start identifying those members who have NATE-certified employees.
 - The goal is to get buyers to look for this certification, which in turn gets them away from the first cost only focus. From the contractor's perspective, this helps him reduce callbacks, which can quickly wipe out any profit on a job.
- NHRWA also does training for contractors, sometimes with the manufacturers but more often on our own. These are typically evening programs with dinner and training, which allows contractors to send their technicians. The training covers new products, technical and maintenance issues, and energy efficiency.

INDUSTRY OBSERVERS . . . EVALUATION TEAM . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS

IN THEIR JUNE 2002 DRAFT EVALUATION OF FOCUS ON ENERGY, THE BUSINESS PROGRAMS EVALUATION TEAM PROVIDED DESCRIPTIONS OF DESIGN/BUILD, PLAN/SPECIFY AND COLLABORATIVE PROCESS MODELS IN THE CONTEXT OF LIGHTING SYSTEM DESIGN AND INSTALLATION. THESE DESCRIPTIONS ARE PARAPHRASED HERE.

- Under the design/build model the owner contracts with a design/build-contracting firm for all design and construction services. The design/build contractor is then responsible for hiring and managing architects, electrical and mechanical engineers, contractors, and advisors as needed. By creating a single point of contact for the owner, major project decisions can be made quickly and efficiently. This design/build scenario is similar to the private market design/build scenario described in the Main Report. The Evaluation Team goes on to specify 3 types of design/build scenarios:
 - When the design/build model is chosen because of the need for quick completion (“fast-track” jobs), the Evaluation Team feels that the contractor has little or no incentive to take budget or schedule risks with innovative designs. If there is an incentive at all, it is usually for early project completion rather than high-quality systems or low operating costs. When contractors bid on the up-front cost of construction, design options that save energy and money over the long term are usually ignored.
 - The design/build model is much more receptive to energy efficient solutions if the owner makes a clear contractual statement requiring specific quality and performance targets for the lighting system.
 - In addition, a new form of design/build construction is emerging with a strong focus on maintenance. The firms specializing in this new approach call themselves "design-build-maintain" firms, and have a commitment to the long-term operation of the buildings, making this model much more attractive from an energy efficiency standpoint.

INDUSTRY OBSERVERS . . . EVALUATION TEAM . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS . . . (CONTINUED)

- The Evaluation Team’s description of the “Plan/Specify” model is as follows. The owner contracts with an architectural or architectural/engineering (A&E) firm for all design services. The architect is then responsible for hiring and managing electrical and mechanical engineers and advisors as needed. A second contract is made between the owner and the prime contractor for all construction services. Some advantages are gained regarding oversight of construction by separating the design and construction roles. The A&E firm may be willing to call attention to construction errors that a design/build contractor might choose to ignore.
 - The Evaluation Team feels that, even though there are “good architects recognize the long-term value of providing a high-quality building, there is almost never an explicit incentive for the architect to provide the tenants with a building with low operating cost or high-quality lighting.”
 - The “notable and rare” exception to this is a building energy performance contract, in which the owner makes a contract with the design team, making a portion of the fee dependent on the measured energy use of the occupied building. The performance incentive increases with decreasing energy cost and may have a cap on the maximum incentive. A penalty is possible for buildings that do not meet the base level. The plan/specify model functions well if the architect has a strong commitment to good lighting or if specific lighting system performance targets are set such as mentioned in the design/build model.
- The Evaluation Team then cites research on a “Collaborative Process” model, which could be considered a subset of the integrated bid/design/build scenario described above. This model stresses the importance of close attention to the organization, management, and interaction among members of the team as an integral part of the design process. This emerging model currently accounts for a small share of new buildings. Those supporting and practicing the collaborative process model may be potential allies for efforts to improve building energy efficiency.

INDUSTRY OBSERVERS . . . INTERVIEWEES . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS

ALL INDUSTRY OBSERVERS INTERVIEWED AGREE THAT ENERGY EFFICIENCY GETS PUSHED TO THE BACK BURNER WHEN CONTRACTORS ARE RESPONDING TO A VERY RIGID, PRICE-DRIVEN SPEC. SUPPLY-SIDE OPPORTUNITIES TO INFLUENCE THE QUALITY AND EFFICIENCY OF THE SYSTEMS INSTALLED DO EXIST, ESPECIALLY IN THE LARGER BUILT-UP JOBS.

- According to the NHRWA, plan and spec in commercial is still widespread in the C/I sector, and forces distributors and contractors to respond solely based on price, no matter how much the distributor may try to emphasize other features. For some light commercial developments wholesalers will have a deal with a developer to supply a given number of units at a certain price.
 - ACCA and many other market actors interviews felt that customers do care at least somewhat about efficiency, but in emergency replacement situations customers care about what can you get in here how fast and how cheap.
 - According to ACCA, the slow economy is also a big factor right now. It leads to fewer planned replacements where there are opportunities for a more thought-out approach to equipment selection. Instead, there is even more of a first cost focus.
- Supply-side opportunities to influence the quality and efficiency of the systems installed do exist, especially in the larger built-up jobs.
 - ACCA noted that if there's a relationship between the contractor and the building owner, or if it's a design-build system, other factors, particularly efficiency, come into play.
 - According to the NHRWA, design/build is a growing part of the new construction market, and is more likely to provide an opportunity to include more efficient systems than, for example, small commercial retrofit.

INDUSTRY OBSERVERS . . . ROLE OF ENERGY EFFICIENCY . . . KNOWLEDGE

GENERALLY, THE LARGER, MORE SOPHISTICATED TRADE ALLIES AND OWNERS ARE MOST KNOWLEDGEABLE ABOUT ENERGY EFFICIENCY (AND MOST RECEPTIVE TO PROMOTING AND PURCHASING ENERGY EFFICIENT PRODUCTS).

- ACCA stated that the advances in energy efficiency have tended to outrun the awareness of buyers; it's not like buying a car, where people do it every couple of years and so are more up on the changes in the market and in technology. People usually replace their air conditioning or heating system only once the whole time they're in a house or commercial building, and then it's usually an unplanned replacement, so they immediately look to first cost. So even though there are tremendous advances in efficiency out there, contractors are hesitant to push the higher efficiencies and risk losing the sale, especially in small commercial, where things are very first cost driven.
- ACCA went on to say that manufacturers certainly emphasize energy efficiency, and most of the more successful contractors also make it part of their emphasis whenever they can. (ACCA members are among the larger, better established contractors.) There are some 50,000 contractors nationwide, most with less than 10 employees and many with 1 to 3 – just a guy with a truck and sometimes a helper. In contrast, 80 percent of ACCA members have 10 or more employees.
- ARI felt that industrial customers generally do a better job of incorporating energy efficient options than to most commercial sector customers.
 - More often than not, the industrial customers have an energy manager and engineers, and routinely tweak their systems/processes and monitor heat exchange and usage. They are more sophisticated than the commercial sector customers because energy generally translates to production capabilities and therefore profit.
 - In commercial facilities, on the other hand, HVAC is often a secondary consideration, with facilities not always having full-time building staffs.

INDUSTRY OBSERVERS . . . ROLE OF ENERGY EFFICIENCY . . . PROMOTION

INDUSTRY OBSERVERS FEEL THAT MANUFACTURERS AND DISTRIBUTORS ACTIVELY PROMOTE ENERGY EFFICIENCY.

- NHRWA observed that, because they have an interest in upselling, wholesalers have always promoted energy efficiency. In 2001 when new efficiency standards were being considered, NHRWA supported them, even though that put some of our members in an awkward position because their manufacturers opposed them.
- NHRWA went on to say that distributors/wholesalers are usually active in promoting energy efficiency, probably more so that a lot of their customers (the contractors), since those contractors worry that they'll lose work on first cost.
- ACCA noted that contractors get information both from distributors and manufacturers, including training, technical information, etc. For business issues they look to our organization, especially their local chapters.

INDUSTRY OBSERVERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS

INDUSTRY OBSERVERS SEE SIMPLISTIC DEMONSTRATIONS OF COST EFFECTIVENESS AS KEY TO THE ACCELERATION OF ENERGY EFFICIENT HVAC SOLUTIONS.

- ARI indicated that the owner is the key decision-maker to educate. The manufacturer certainly already has a full gamut of energy efficiency products, they already know the economics and the mechanical ins and outs of various options. Many contractors are the “least common denominator,” they have no interest in the energy efficiency rating of the end user’s selection. Since the consumer of the equipment/technology owns it, is responsible for maintaining it, and will ultimately reap the benefits of savings, they are the link in the chain that need education about energy efficient alternatives – contractors do not.
- ACCA noted that a problem common to end users and suppliers is that no one — not manufacturers, not utilities, not ARI — can quantify the benefits of energy efficient systems for a particular customer. There are always ranges, and caveats, so the contractor ends up selling these as generally “better” systems.
- ARI felt that building owners are not sophisticated, through no fault of their own, to ask about specific technological options, particularly if it is being built on a spec or if the system is already in place. The ARI representative went on to say that the diagnostic tools for energy usage are still too sophisticated for small, commercial facilities to interpret. This is an area where, in the ARI representative’s opinion, Focus on Energy outreach could make the most impact.
- Furthermore, according to ACCA, the equipment and systems are out there. The next step is to evaluate the tools and their benefits in a user-friendly way. A study to demonstrate the capabilities and comparisons of different technologies would then give the building owner something to look at when making decisions on upgrades or replacement(s).
- A UW Madison representative interviewed in Phase I feels that rebates should not be for things like, for example, preventative maintenance on a boiler that the end user should be doing anyway. Incentives should be directed at system improvements. Focus should also take care that they are not propping up choices that will not be made in the future without state assistance.

A.3 MANUFACTURERS

Exhibit A-1
Overview of HVAC System Sales by Large HVAC Manufacturers Interviewed
(Sales in 2001)

Company	2001 HVAC&R Revenues (\$Billions)				C/I Sector Products				Percent of Sales in:	
	Total	US	C/I Sector	C/I Sector in Wisconsin	Boilers	Furnaces	Chillers/Built-up Systems	DX/Unitary/Packaged Systems*	C/I Sector	Retrofit Projects
TOTALS	21.0	12.7	7.5						60%	66%
Carrier	42%	37%	42%	DK		Roof-top	Yes	Yes	67%	70%
Trane	22%	25%	28%	0.1		Roof-top	50%	50%	65%	67%
York	19%	16%	19%	DK		Roof-top	Yes	Yes	70%	60%
Lennox	15%	20%	9%	DK		Roof-top		Mainly	27%	DK
McQuay	2%	2%	3%	0.01		Roof-top	Mainly	>40 Tons	100%	40%

* DX systems include heat pumps.

Sources: Company Web sites, interview results

MANUFACTURERS . . . INTERVIEWEES . . . HVAC

AFTER THE INDUSTRY ASSOCIATION INTERVIEWS, 11 HVAC INDUSTRY MANUFACTURERS AND MANUFACTURER REPS — REPRESENTING 6 HVAC, 3 BOILER AND 2 FURNACE INDUSTRY COMPANIES — PROVIDED OPINIONS ON THE INDUSTRY AND THE FUTURE FOR ENERGY EFFICIENT HVAC SYSTEMS.

- Six interviews with representatives of the five major HVAC cooling system manufacturers were conducted in October 2002. Interviewees were:
 - Trane: Manager of Milwaukee District Office; Senior Principal Applications Engineer
 - Carrier: Product Manager, Chillers
 - York: Manager, Industry Relations; former Chillers Product Manager
 - Lennox: Utility Liaison
 - McQuay: Marketing Manager.
- Carrier, Trane and York are generally thought of as the “Big Three” in C/I sector HVAC sales, accounting for 42, 28 and 19 percent of total C/I sector sales in 2001 (see Exhibit A-1). All three work both in the chiller and packaged system markets. Lennox — which is stronger in the residential market than York — operates more in the packaged system C/I market than in the chillers market. McQuay, on the other hand, specializes in chillers and, to a lesser extent, large (40 ton and above) packaged units.
- Trane and Carrier are the largest cooling system manufacturers in Wisconsin, with Trane especially strong in Wisconsin because they are headquartered in La Crosse.
- C/I sector sales account for at least 65 percent of sales for all of the companies except Lennox (which concentrates in the residential sector). Note in Exhibit A-1 that McQuay operates exclusively in the larger C/I sector.
- While all of the companies sell rooftop units with gas heating capability, Lennox appears to most actively promote its furnaces in the C/I sector. Carrier and Trane both sell smaller furnaces to the smallest C/I customers, using units that are targeted primarily towards the residential market.

MANUFACTURERS . . . INTERVIEWEES . . . HVAC

- Similarly, retrofit applications account for between 60 and 70 percent of the C/I sector sales for the “Big Three”. Due at least in part to their concentration on large, built-up system, retrofit applications are less prevalent for McQuay (at 40 percent). The Lennox representative did not know the retrofit/new construction breakdown off hand.
 - Carrier, a subsidiary of United Technologies, sells the full range of C/I HVAC equipment; the chiller business is out of New York, the unitary business is run from Oklahoma. Corporate headquarters are in Connecticut, where the company was founded.
 - Trane is a subsidiary of American Standard. Trane Commercial Systems is headquartered in La Crosse, WI, where the company was founded. Trane’s C/I business “is about evenly split between unitary 5-25 ton units and built-up systems.
 - Headquartered in York, PA, York International operates exclusively in the HVAC and refrigeration (HVACR) industry. York’s commercial sales (through the Engineered Systems Group (ESG)) represent 70 percent of total sales, with the Unitary Products Group (which produces HVAC systems for residential and light commercial applications) accounting for the remaining 30 percent.
 - Lennox, headquartered in Dallas, TX, had total sales of \$3.1 billion, all of which is HVAC related. Of the \$3 billion in equipment sales, 27 percent is commercial. As stated on its web site, Lennox’s Commercial Air Conditioning division “manufactures and sells heating and cooling equipment used to condition the space in low-rise commercial buildings such as shopping centers, offices, schools, and restaurants.”
 - McQuay, headquartered in Minneapolis, MN and part of a Malaysian holding company, concentrates on air conditioning and filtration operations. The pioneer of the manufacture of the steam engine, McQuay primarily sells the larger chillers; they have some package systems, but even those are at least 40 tons. As such, they operate exclusively in the C/I market.

MANUFACTURERS . . . INTERVIEWEES . . . BOILERS AND FURNACES

THREE BOILER MANUFACTURER/MANUFACTURER REP AND TWO FURNACE MANUFACTURER INTERVIEWS WERE CONDUCTED IN DECEMBER 2002.

- Interviewees were:
 - Boilers
 - .. Cleaver Brooks: Director, Indoor Sales
 - .. Manufacturer's rep for Cleaver Brooks, Patterson-Kelly and Fulton Boiler: Sales Engineer
 - .. Manufacturer's rep for Burnham Industrial, Bryan, Thermal Solutions: Vice President
 - Furnaces
 - .. Carrier: Product Manager, Large Rooftop Units
 - .. York: Unitary Products Group Commercial Products Marketing Manager.
- Unlike gas furnaces, which are typically manufactured by the same manufacturers as DX units, boiler manufacture has little overlap with other aspects of the HVAC market. Boiler manufacturers include:
 - A.O. Smith Company
 - Aerco International
 - Bryan Steam Corporation
 - Buderus Hydronic Systems
 - Burnham Corporation
 - Cleaver-Brooks
 - Dunkirk Boilers
 - Fulton Boiler Works
 - GasMaster Industries

Exhibit A-2
2001 Residential HVAC Market Share (% of Total Market)

Manufacturer	Air Conditioning			Furnaces			Total	Brands
	CAC	HP	Total	Gas	Oil	Total		
UNITS (thousands)	4,839	1,442	6,281	3,062	122	3,184	9,465	
United Technologies	31.0	31.5	31.1	33.5	12.5	32.7	31.6	Carrier, Bryant, Payne, Airstart, Arcoaire, Comfortmaker, Heil Tempstar
Goodman	15.5	12.0	14.7	16.0		15.4	14.9	Amana, Goodman, Janitrol, QuietFlex
American Standard	10.0	27.5	14.0	13.0		12.5	13.5	Trane, American Standard
Lennox	12.5	7.0	11.2	15.0	43.0	16.1	12.9	Armstrong, Lennox, Ducane
Rheem/Paloma Industries	10.5	12.0	10.8	10.0	7.0	9.9	10.5	Rheem, Ruud
York	7.5	4.0	6.7	6.0	6.0	6.0	6.5	York, Luxaire, Coleman
Nordyne	6.5	4.5	6.0	4.5	3.0	4.4	5.5	Frigidaire, Tappan, Gibson, Kelvinator, Philco
Burnham					12.0	0.5	0.2	Burnham
Others	6.5	1.5	5.4	2.0	16.5	2.6	4.4	

Source: Appliance Manufacturer, Special Report: 2002 Market Profile

MANUFACTURERS . . . INTERVIEWEES . . . BOILERS AND FURNACES . . . (CONTINUED)

- Hydrotherm
 - Lochinvar Corporation
 - Patterson-Kelley Corporation
 - Peerless Heater Company
 - PVI Industries
 - Raypack
 - RBI Water Heaters
 - Slant/Fin Corporation
 - Teledyne Laars
 - Thermal Solutions
 - Viessmann Manufacturing Co.
 - Weben-Jarco
 - Weil-McClean
-
- ABMA reports having “about 50 manufacturers who account for most of the US industry (probably 85 percent) – although this includes suppliers of components such as burners and controls, as well as complete boilers. And while CIBO is primarily an owners association, its associate members include about 30 companies who manufacture boilers and components or provide related services.
 - The DOE-OIT representative notes that the industry has seen ongoing consolidation that has reduced the number of players over the past several decades. This is due both to downsizing, consolidation and offshore production in many of the industries that are the primary markets for industrial boiler manufacturers and to the fact that many industrial and large commercial users are deferring replacement of equipment to avoid a stringent regulatory review process, as discussed below.
 - Data on commercial/industrial sector market share by product are not available. As a point of interest, data on residential sector market share (which would be comparable to small C/I sector systems) is presented in Exhibit A-2.

MANUFACTURERS . . . BUSINESS PRACTICES . . . DISTINGUISHING CHARACTERISTICS . . . HVAC

THE HVAC MANUFACTURERS STRESS DIFFERENT ATTRIBUTES OF C/I HVAC EQUIPMENT, RANGING FROM RELIABILITY, COMFORT, INNOVATION, ENVIRONMENTAL ACCEPTABILITY, SERVICE, AND NOISE LEVELS. ENERGY EFFICIENCY IS A KEY SELLING POINT FOR ALL OF THE HVAC MANUFACTURERS.

- Trane’s overall advertising themes are reliability (“It’s hard to stop a Trane”) and comfort. This carries through in everything the company does and in their messages their trade allies and customers. The message is delivered in different ways to end users and trade allies. Advertisements are primarily end user focused, while Trane is more likely to use a training format for architects, engineers and contractors.
- Carrier calls itself the “world leader in air conditioning, heating and refrigeration systems” and is celebrating the 100th anniversary of “Willis H. Carrier’s invention of scientific air conditioning”.
- York stresses offering a complete line of environmentally acceptable and energy efficient products. The company seeks to take advantage of regulatory changes by developing products that comply with tightening environmental and energy efficiency requirements and regulations before they become effective.

MANUFACTURERS . . . BUSINESS PRACTICES . . . DISTINGUISHING CHARACTERISTICS . . . HVAC . . . (CONTINUED)

- The main messages at Lennox are energy efficiency and serviceability. One of their corporate goals is to have the most efficient systems in their markets. The small footprint of the systems, and low installation costs are also emphasized. The basic message is the same for end users and contractors; also Lennox may emphasize the low operating cost more to owners and ease of service more to contractors.
 - Lennox tries to push the energy efficiency message for all of its systems, but does have some products that are specifically designed to provide a solution for plan and spec contracts where price is everything.
 - Lennox’s initial success with their energy efficient product lines came with national accounts, which continue to be in the lead in installing these systems. Lennox has expanded its sales efforts directed towards these accounts, and to smaller multi-site regional accounts.
- McQuay’s two biggest selling points are energy efficiency and low noise levels. Specializing in large chiller systems, McQuay positions itself as the most efficient and quietest, and pursues product development strategies – such as evaporative cooling systems in the 60-240 ton range – that support these features.

MANUFACTURERS . . . BUSINESS PRACTICES . . . DISTINGUISHING CHARACTERISTICS . . . BOILERS

BOILER MANUFACTURERS STRESS LONG LIFE, RELIABILITY, EASE OF SERVICE AND EFFICIENCY (IN THAT ORDER). REPRESENTATIVE COMMENTS ARE PRESENTED BELOW.

- “We emphasize our track record, reliability and longevity, and efficiency. Cleaver Brooks has always taken the lead in efficiency. Our units are also easier to repair; some of those smaller ones you can't really fix; they're more of a throwaway boiler. Also, a lot of those are just straight gas; there's no alternative fuel capability -- which of course you need in something like a hospital.
- “Quality and reliability are the biggest selling points. We want to be able to assure people that they're not going to get that 3 o'clock Sunday morning call that they have a building down. To a lesser degree we also emphasize operating cost, particularly energy efficiency.”

Exhibit A-3 Relationships Among Manufacturers, Distributors and Contractors

Company/ Product	Product		Related Services	Affiliated Distributors	Contractor Preferences	
	Large, Built-Up Systems	Packaged Systems			Preferred	Mentioned
Air Conditioning and Heat Pump Systems						
Carrier	Most C/I sector sales go through "three or four" sales offices in Wisconsin and associated distributors.		Technical support for installation of chiller systems, and service when needed.	Temperature Systems; Auer Steel	5	13
	Sales offices for most chiller work, with some dedicated distributors (with in-house engineering staffs) operating in the chiller arena	More often sold through distributors and contractors				
Trane	Commercial systems sold both through District Offices (Madison, Milwaukee) and independent distributors.		Emphasizes "becoming the total solution for its customers' needs, providing equipment, controls, service, parts and performance contracting", especially for larger built up systems.	Gustave Larson	9	17
	The District Offices typically handle the chillers and the larger packaged systems, with some sold through larger distributors that have internal engineering staffs to support the larger systems.	Distributors concentrate more on smaller systems				
York	Maintains its own sales offices primarily in the larger markets, and sells through sales representatives in smaller markets. York has reps in 4 Wisconsin locations, including Milwaukee and		All the installation and start up for large chillers, and runs the systems in some cases.	Milwaukee Stove; Vyrone; Westburne Supply	--	3
	Internal sales engineers account for approximately 75% of large, built-up equipment sales with the remaining portion coming from sales agents and independent distributors.	The York brand is sold through company-owned distribution centers and exclusive independent dealers. Other brands are sold through non-exclusive distributors primarily for resale to contractors.	Provides a complete range of maintenance and repair services, especially for built-up systems.			
Lennox	--	Uses a 2-stage rather than a 3-stage marketing approach. Lennox acts as its own distributor, and sells through their own sales offices to their partner contractors.	Partner contractors provide most of the ancillary services.	N/A	3	3
McQuay	All sales are made through their representatives. These distributors handle other products, but none that compete with McQuay directly.		Provides technical assistance and support, but contractors handle most of the installation and service work.	KGA, Access	--	5
Heating Products						
Boilers	Boiler manufacturers sell through independent, affiliated reps or distributors, who sell to contractors, sometimes to consulting engineers and sometimes to owners directly.		Manufacturers provide on-line resource materials for their reps. Distributors assist engineers design specs, and work with selected contractors on product features and installation techniques.			
	The boilers are installed by independent contractors, but manufacturers supervise the start-up, for warranty and liability reasons. Consulting engineers develop the specifications for larger jobs, including some replacements.		Some distributors and manufacturers reps provide operation and maintenance training with the systems they sell.			
Furnaces	--	Gas furnaces are typically manufactured by the same manufacturers as DX units, and follow similar distribution paths.				

Sources: Interviews, company web sites

MANUFACTURERS . . . PRODUCT FLOW . . . HVAC

AS SHOWN IN EXHIBIT A-3, WHILE THERE ARE SIMILARITIES IN PRODUCT FLOW AND SERVICE OFFERINGS AMONG THE MANUFACTURERS INTERVIEWED, EACH HAS DISTINGUISHING CHARACTERISTICS.

Trane, Carrier and York have sales offices for most of their chiller work, with only a few specialized distributors (with in-house engineering staffs) operating in the chiller arena. Smaller packaged systems are more often sold through distributors, although there is some overlap. Lennox (which concentrates more on smaller systems) operates its own distribution network with “partner” contractors. McQuay’s sales are made through their representatives, who handle products in addition to those McQuay offers, but none that compete directly with McQuay. All 5 of the manufacturer sell directly to the end-user (often through a contractor), especially for larger systems. Specifics are highlighted below.

- Trane sells commercial systems both through their District Offices (Madison, Milwaukee) and through independent distributors. Gustave Larson is Trane’s largest distributor in Wisconsin.
 - The District Offices typically handle the chillers and the larger packaged systems while the distributors concentrate more on the smaller units, although there is overlap.
 - Trane also sells directly to the building owner, even though the sale may be made to the contractor. Schools usually buy from Trane directly to avoid having to pay sales tax.
- The Carrier representative noted that most C/I sector sales go through their “three or four” sales offices in Wisconsin. These offices are sometimes manned by Carrier employees and sometimes by manufacturer reps, depending on the size of the market. Distributors include Temperature Systems and Auer Steel and Heating Supply.
 - Carrier estimated that probably 80 percent of chiller sales go through contractors. Most of the other 20 percent of sales are directly to end-users. Engineers write the specifications but don’t actually purchase the equipment.
 - For unitary commercial systems the percentage through contractors is probably even higher.

MANUFACTURERS . . . PRODUCT FLOW . . . HVAC . . . (CONTINUED)

- York maintains its own sales offices primarily in the larger markets, and sells through sales representatives in smaller markets. York has reps in Milwaukee, Green Bay and “a couple of other places” in Wisconsin. These reps include Milwaukee Stove, Westburne Supply and Vyrone.
 - York’s internal sales engineers account for approximately 75 percent of ESG’s (built-up) equipment sales with the remaining portion coming from sales agents and independent distributors.
 - In the Unitary Products Group (residential and light commercial), the “York” brand is sold through company-owned distribution centers and exclusive independent dealers. Other brands are sold through non-exclusive distributors primarily for resale to contractors.
- Unlike the other HVAC manufacturers, Lennox uses a 2-stage rather than a 3-stage marketing approach. Lennox is its own distributor, selling through its own sales offices to their partner contractors. Lennox feels this gives them more control and keeps them closer to the customer.
- Many of McQuay’s sales are made through their representatives. These are KGA in Milwaukee and Madison, Access in Appleton, and a few others. These distributors handle other products, but none that compete with McQuay directly. In addition, McQuay sometimes sells direct to the owner and to contractors, depending upon the make-up of the projects.

MANUFACTURERS . . . PRODUCT FLOW . . . BOILERS

BOILER INSTALLATIONS ARE SUPERVISED BY BOILER MANUFACTURERS THROUGH THEIR REPS. MOST OF THE REPS HAVE SERVICE COMPANIES, AND SOME ACT AS CONTRACTORS AS WELL.

- A manufacturer reported that “We don't do the installations, but we do require that we supervise the startup, through our reps, most of whom have service companies. In Wisconsin we actually have a separate sales agent firm and a service firm. A few reps also act as contractors, which can lead to conflicts with other contractors who are their customers. The reps also do service; some buyers opt for that even though it costs a little more.”
- A large manufacturer’s rep added “We provide technical assistance to the contractors and in some cases service, but we won't go in and compete against a contractor who has an established relationship with a customer.”

MANUFACTURERS . . . PRODUCT FLOW . . . ANCILLARY SERVICES . . . HVAC

BASED ON THE INTERVIEWS CONDUCTED AND A REVIEW OF THE HVAC MANUFACTURERS' WEB SITES, TRANE AND YORK ARE THE MOST ACTIVE IN PROVIDING TECHNICAL AND OTHER SUPPORT TO THEIR CUSTOMERS, MAINLY ON THE LARGER, BUILT-UP INSTALLATIONS.

- Trane's Commercial Systems emphasizes "becoming the total solution for its customers' needs, providing equipment, controls, service, parts and performance contracting", especially for larger built up systems. A Trane representative said that Trane "will even go in and provide the system and operate it as a performance contract".
- York does all the installation and start up for large chillers, and, in some cases, runs the systems for its customers.
 - York's representative — who noted that some customers go with just the standard one-year warranty while others want a service contract — feels that York "has probably the largest service organization in the business."
 - In addition, York provides a complete range of maintenance and repair services, especially for built-up systems. "We provide maintenance and repair services for both our equipment and that of third parties, although the majority of the work is performed on our equipment."
- The Carrier representative, on the other hand, noted that they provide technical support for installation of chiller systems, and service when needed. Lennox noted that their partner contractors provide most of the ancillary services. McQuay notes that it tends to be somewhat less involved in the service side than their (high-end) competitors. McQuay provides technical assistance and support, but the contractor handles most of the actual installation and service work.

MANUFACTURERS . . . TRAINING

ALL OF THE MANUFACTURERS ACTIVELY TRAIN THEIR SUPPLY-SIDE ALLIES.

Distributors, designers and contractors interviewed obtain training on current HVAC technologies and techniques primarily from the manufacturers of the products they sell. Most of the manufacturer training is put on by the affiliated distributor in the local area. Trane has training at its local headquarters in La Crosse.

- Trane has training on product features, “not too long, usually one day. Efficiency is part of that because it helps us sell.” The training is geared towards “not just contractors, but design engineers, architects, owners — all the people involved in the process”.
- York provides information to all the players and training for their reps, contractors, and even the operations staff of the building owner. York has a full-time training staff, and when a new system is installed they’ll go in for three days of set up, which includes a half-day just to train the building operators.
- Lennox uses its web site extensively and has seminars for contractors. These are sometimes put on by the local office, or the contractors are sometimes brought to corporate facilities.
 - “For most of the contractors who do a lot of commercial work, knowledge is not a problem; we work with them and train them and can assure that they’ll do a good job. The bigger knowledge issue is with residential contractors who do a few commercial jobs or who try to expand into commercial. That’s one of the reasons we have the web site.”
 - Lennox also educates contractors in how to sell. Many of the contractors came up through the business, starting as techs, so they have little concept of things like upselling or promoting energy efficiency.
- McQuay provides frequent and extensive training for its reps, focusing primarily on technical and installation issues, including efficiency. These sessions can run several days, as “everything — marketing information, product specs, technical literature — goes through the reps”. The reps provide most of the training for contractors, and exercise quality control to make sure the contractors who install our equipment are qualified.

MANUFACTURERS . . . PRODUCT FLOW . . . RURAL MARKETS . . . ALL MARKET ACTOR GROUPS

GENERALLY, MARKET ACTORS DO NOT SERVE THE RURAL MARKETS ANY DIFFERENTLY THAN THEY SERVE OTHER MARKETS. RURAL MARKET “SPECIALISTS” ARE THOSE CONTRACTORS AND, IN SOME INSTANCES, LOCALLY ORIENTED DESIGNERS, THAT ARE LOCATED IN THE RURAL MARKET.

Focus is interested in the way in which rural markets are served by supply-side market actors. Since the responses are similar across market actor group they are summarized here (in the “Manufacturer” section) so that the reader has an integrated view of market actor insights into rural markets.

- When asked about how they serve rural customers, the *manufacturers* indicate that similar channels are used as in other markets, with the size of the customer often the key consideration.
 - Trane noted that these markets are handled the same as any other. It depends on the size of the end user; the smaller guys go to contractors, the larger deal with us directly.
 - Carrier said that these markets are handled through the same channels as other markets, although rural and smaller markets are more likely to be served by reps than by “our own people”.
 - York provided comments similar to Carrier and Trane.
 - Lennox felt that their contractors would provide most of the service to rural markets.
 - McQuay’s sales would be handled through their reps and contractors, although there are “not all that many chillers in rural areas”.
- There is little differentiation between rural and other markets on the part of *distributors*, as they sell to contractors (for example) in rural areas when the demand is there. Two of the distributors mentioned that, because of their location, they concentrated somewhat on the rural market.

MANUFACTURERS . . . PRODUCT FLOW . . . RURAL MARKETS . . . ALL MARKET ACTOR GROUPS . . . (CONTINUED)

- Most of the *designers* interviewed do not distinguish between rural and other markets, with only one noting that they target a rural market (school districts). 3 of the designers indicated they will participate in rural solicitations when asked, and two others noted that the rural part of Wisconsin was in their local area.
- Similar to the other market actors, there is little differentiation between rural and other markets on the part of *contractors*.
 - Ten of the contractors said they treated rural customers like anyone else, one noted they have an established network of foremen in the rural area and another said they rely on subcontractors.
 - Only one contractor mentioned charging a travel fee, saying they “generally negotiate some type of fee rather than our standard billing. We normally charge 90 cents per mile but if its travelling to a rural area and we’d like to do that customers work we’d probably negotiate a travel rate to get there to make us competitive with any type of local competition. I’d typically charge a flat rate of \$25 to travel some place that would be 60 miles away, something like 120 miles roundtrip we’d probably charge \$25 Or \$30 flat fee.”
 - Another contractor noted that if the job is attractive enough they would go after it, while two others indicated that there is minimal C/I sector work in most rural areas.

MANUFACTURERS . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS

GENERALLY, MANUFACTURERS FEEL THAT OPPORTUNITIES TO INFLUENCE HVAC SYSTEM DESIGN ARE GREATER IN DESIGN/BUILD THAN IN PLAN AND SPEC PROJECTS.

- All of the manufacturers interviewed mentioned the recurring theme of high quality, energy-efficient systems for custom built-up work and low cost for “plan and spec/spec and build” jobs. Generally, the sale of top-of-the-line systems requires extensive marketing to the building owner. Comments by a one representative are typical of the first point.
 - “Because there are different markets we have to be different things to different people; some sales, especially in small commercial are totally price driven; others, like manufacturers and large institutions, are more receptive to value added solutions.
 - “In design/build jobs, the engineer/designer and the contractor are one and the same. In other cases, its spec and bid, especially for smaller commercial, where price is everything.”
- In replacement jobs, one manufacturer noted that what often happens is that the owner hires somebody, like an A&E firm to do the whole thing for a fixed price. Many of the manufacturers noted that influence over the type of system installed is much greater in planned versus emergency replacements.
- According to Trane, about 60-70 percent of new building work is plan and spec, where a design engineer puts together a spec and the low bid wins. Regarding plan and spec jobs in general:
 - “First cost subject to meeting specifications drives the majority of packaged system sales. And since the state code is what’s specified, that’s most of what we sell.”
 - “In some cases, however, there will be voluntary alternates in the bid package; those may have to do with saving money by going with a more bare bones system, or they may have to do with getting more energy efficiency or other features for added cost. It’s not unusual for the bid to be awarded based on the cost of the specified system and then to have the buyer opt to take one of the alternatives later.”

MANUFACTURERS . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS . . . (CONTINUED)

- In design-build contracts, there is typically an in-house design engineer who puts together a spec, takes bids, and selects the supplier.
 - According to Trane, there's more of this than 15 or 20 years ago, but it still hasn't taken the world by storm.
 - Trane also notes that custom systems are required for the largest commercial and industrial projects. "For industrial in particular there are very different requirements in that you're dealing with very cold water and big temperature differentials."
- Carrier tries to influence how the spec is written, especially on larger jobs. They reach out to owners as well as engineers, and try to get them to come up with a value added spec.
 - Carrier pushes a total value approach that takes into account efficiency, maintainability and other aspects of life cycle cost in its large chiller jobs.
 - Indoor air quality is also a big issue, which is tied into having a system that works well as a total system.
- York adds that there is almost always some sort of formal bid process; the question is whether you were able, through your sales people or reps, to influence the design spec in your favor.
- McQuay is committed to doing energy efficient chillers. While that helps to define the company in the marketplace, it does cause McQuay to lose some business on plan and spec jobs where first cost is everything.
 - McQuay sells primarily in the commercial sector, a lot to schools. Industrial sales are made with the same types of systems as go into commercial. That is, McQuay builds to order based on what the customer wants, but in accordance with their equipment offerings and options.
 - Because McQuay concentrates on the higher end systems, they "probably" do a little less plan and spec than the other firms.

MANUFACTURERS . . . EQUIPMENT SELECTION . . . KEY INFLUENCERS/DECISION-MAKERS . . . HVAC

HVAC MANUFACTURERS ADJUST THEIR PRODUCT OFFERINGS TO THE KEY DECISION-MAKERS IN DIFFERENT SITUATIONS.

- Moving through the decision-making chain, one manufacturer noted that: “For wholesalers, we want to have a broad range of small commercial systems; for contractors, have the most economical unit that meets spec; for owners, emphasize total value of the system. Engineers are more sophisticated (than other players), but they rarely make the purchase decision.”
 - “Efficiency is important sometimes, but usually only when the owner gets involved.
 - “Engineers and contractors won’t usually specify energy efficiency. Contractors are absolutely always in a low bid situation in plan and spec jobs, and in design-build jobs there’s a tendency to go cheaper on the HVAC to make up for overruns elsewhere in the project.”
- Another manufacturer emphasizes life cycle cost to owners, price to contractors, and a list of features to the engineers.
 - “In smaller buildings, or maybe less sophisticated buyers like office owners, we have to emphasize price more and life cycle costs less.
 - “Both architects/engineers and contractors play an important part in determining which manufacturer's products will be specified and ultimately used in an application.

MANUFACTURERS . . . EQUIPMENT SELECTION . . . KEY INFLUENCERS/DECISION-MAKERS . . . BOILERS

BOILER MANUFACTURERS AND MANUFACTURER REPS NOTED THAT THE KEY DECISION-MAKERS VARY BY THE SIZE OF THE SYSTEM.

- “For some of the smaller systems, the owner may just go with a contractor and a system; for the larger units with more sophisticated controls, especially new construction, there's more likely to be a design engineer who develops the spec. But even then, we'll sometimes have an owner who wants to replace his old boiler with one that will match up to the steam distribution system and doesn't want to go through an engineer.
- “For both commercial and industrial, most sales are made to contractors who respond to a spec developed by an engineering firm. A small percentage, maybe 10-20 percent, might be direct sales to an owner. This happened a few months ago with a school system that had to replace some boilers and went with one brand because that's what their other systems were. The rest are made to contractors, sometimes in collaboration with engineers, sometimes in response to an engineering spec.”

MANUFACTURERS . . . MARKET, TECHNICAL AND REGULATORY TRENDS . . . MARKET TRENDS

MANUFACTURERS MENTION THE ECONOMY AND THE DRYING UP OF UTILITY REBATE MONEY AS KEY MARKET TRENDS.

- One HVAC manufacturer noted that it's currently a buyers market, which pushes pricing levels down and lets buyers get more for less. The biggest other market trend is the fact that the commercial industrial market is pretty soft now that companies have cut back their capital spending.
- Another noted that the drying up of utility rebate money has "certainly set back the efficiency level out there; with the rebates it was easier to sell first-cost oriented buyers on energy efficiency. On the other hand, energy efficiency is now well established in the market; there's never any doubt that we can get an efficient unit to a customer about as quickly as a standard unit." This sentiment is true across manufacturers.
- Boiler manufacturers reported that the boiler market is mature, and, partially because of the economy, a lot of customers are overhauling existing systems rather than replacing them.
 - "Our business is a very mature market; what's happened is that the new market is less than half what it used to be; the replacement market has helped us get through the ups and downs.
 - "Instead of replacement, people are overhauling or repairing older systems – adding new burners, changing out tubes. Almost half our business this year has been those kinds of overhauls and repairs."
 - "We do see that the market is becoming more price-driven as the economy stays weak; there are just more first-cost oriented purchases. We offer some products to meet that need, but of course something has to give -- usually the level of reliability and quality. The other thing we've seen is the build/own/operate approach; I often wonder why more companies don't use that, since it frees them from putting the money up front."

MANUFACTURERS . . . MARKET, TECHNICAL AND REGULATORY TRENDS . . . TECHNICAL TRENDS . . . HVAC

TOTAL SYSTEM SOLUTIONS, ENHANCED CONTROLS, VARIABLE SPEED DRIVES AND EXPANDED PRODUCT LINES ARE AMONG THE MAJOR TECHNICAL TRENDS CITED BY HVAC MANUFACTURERS.

- According to Trane, it is becoming clear that there are many more opportunities to get more efficient operation in the way the system is designed and operated than in the efficiency rating of the rooftop unit or chiller.
 - “Taking a system integration view of the entire system, including the building envelope, is probably where the greatest potential lies for future efficiency gains. So many systems are put together with excellent equipment but are poorly integrated. That cuts across customer types and even system types, since you get a lot of these issues even with packaged systems.”
 - “The biggest trend is probably the growing recognition that a system should work as a system – whether it’s a built-up system with chilled water or a rooftop system with air handlers and VAV boxes (variable air volume terminal units in the air handler system).”
 - Sales of systems that automatically control a building's performance, including energy consumption and air quality, continue to grow as a percentage of Trane’s total sales. In fact, indoor air quality has emerged as a significant application of Trane’s products and services.
- Interoperability of control systems affects efficiency as well as overall performance. Availability of controls adds new capabilities if the systems are designed to handle them.
 - Carrier notes that variable speed drives have become much more of an integral part of the market, with “tremendous” energy saving potential. Particularly in temperate climates, systems operate away from design conditions most of the time. According to the Carrier representative:
 - Using the features of ASDs to enhance performance at less than full load could change how equipment is designed and operated. But it depends on climate and on the rate structure whether buyers embrace this.

MANUFACTURERS . . . MARKET, TECHNICAL AND REGULATORY TRENDS . . . TECHNICAL TRENDS . . . HVAC . . . (CONTINUED)

- Energy efficiency under actual operating conditions continues to be a major emphasis at York, but York is also increasing the user friendliness of the control system, with centralized displays that allow monitoring of all system operations. This also means the system is easier to maintain.
 - York’s big pitch in built-up systems has been energy efficiency at part load. Since chillers spend most of their time running at less than full capacity, York has been emphasizing putting adjustable speed drives on their chillers to save energy. Monitoring and control technologies fit into this strategy.
 - In addition, York notes that it has ““increased the overall efficiency of our product offerings by employing internally developed advanced heat transfer and compressor technology and introducing large air conditioning systems that utilize advanced thermal storage and absorption technologies.”
- Lennox notes that controls, energy recovery and modular system design are the major trends.
 - The Lennox representative feels that they “have pretty much done what we can in energy efficiency with existing technologies. The next big thing may be energy recovery (e.g., from waste heat).”
 - Lennox emphasizes controls with our L-connection network; single point of control for monitoring and controlling many parameters. “A systems approach is a big thing now, and controls help make that possible.”
- McQuay uses “all the latest technologies to ensure that we have the most efficient products out there.”
 - Evaporative cooling has the greatest technical potential relative to energy efficiency, and running chillers in tandem to follow the load is an excellent idea.
 - There are some thermal storage installations, but this is not a big trend, in spite of rate structures.

MANUFACTURERS . . . MARKET, TECHNICAL AND REGULATORY TRENDS . . . TECHNICAL TRENDS . . . BOILERS

THERE ARE CONTINUED EFFORTS TO IMPROVE THE ENERGY EFFICIENCY OF BOILERS, IN PART BECAUSE OF FOCUS ON ENERGY EFFORTS, IN THE OPINION OF ONE MANUFACTURER'S REP.

- “The biggest trend is this installing multiple boilers that you bring on line as needed. A lot of engineers seem to be specifying those. We're also working on a high efficiency boiler, either a condensing or semi-condensing unit that would get us up to the 90% efficiency range. One of the big changes has been the advance in burner technology that allows attainment of stringent NOx emission requirements at much lower cost than before. You used to have to put a \$500,000 catalytic converter at the back end to get down to the 9 ppm required by CA, with a new burner you can do it for about \$10,000.
- “Condensing boilers are certainly an advance that affects efficiency. Probably about 15 percent of the heating boilers we sell are condensing units. They cost about 15 percent more than a conventional boiler of the same size. As far as controls, they've become pretty much commoditized; what I mean is that everyone has them. And yes, it allows you to control turndown by having multiple boilers that you can use depending on whether it's 50 degrees or minus 20, but that's not unique or all that new.
- “There is a trend toward greater efficiency. In fact, we decided last year that we needed a product line with more of an efficiency focus, so we went shopping for a new line and added Thermal Solutions. Some of that is being driven by Focus on Energy and the grants they give for high efficiency installations. There are some condensing boilers out there – they pretty much have to be to get above 87% efficient – but nobody knows how long they're going to last. There hasn't been that much experience with them. Earlier this year we had to replace a condensing unit that was only 7 years old. It was one of those 92% efficient models, but it only lasted 7 years.”

THE KEY REGULATORY TRENDS IN THE HVAC INDUSTRY ARE THE NEW ASHRAE 90.1 STANDARDS AND THE DEVELOPMENT OF SYSTEMS FOR NEW REFRIGERANTS. NONE OF THE MANUFACTURERS SEE THESE AS MAJOR OBSTACLES.

- ASHRAE 90.1 (the new HVAC efficiency standards) is increasingly being adopted as code by various states (12 as of mid-2002). Wisconsin is not due to adopt it until 2003.
 - Carrier noted that the standards have a big impact, since a lot of specs are based on them.
 - In the opinion of one manufacturer, Wisconsin was too far along in the code development cycle to allow adequate time for public review and input. Carrier, however, is pushing to have the spec rewritten to take better account of part load performance, which is possible since this is a continuously maintained standard.
 - York, noting that the ASHRAE 90.1 standards for chillers are really pretty state of the art, also says that their big problem with them is that they're based on full-load efficiencies.
 - .. "With ASDs you save lots of energy but pay a 3 percent loss at the design load, which makes the requirement for a 300-ton chiller pretty hard to attain."
 - .. York is "putting ASDs on about half our chillers now, and when you have to meet ASHRAE 90.1 with those that's hard".
 - .. York, like Carrier, is trying to influence the standard, which is doable since it's under "continuous maintenance." What's odd in York's opinion is that 90.1 requires VSDs on pumps, VAV systems, and cooling towers, but then discourages it on the chillers themselves.
 - McQuay's entire product line is ASHRAE 90.1 compliant. McQuay also notes that, wherever noise is an issue, whether by regulation or customer requirement, it's usually a plus for McQuay.

MANUFACTURERS . . . MARKET, TECHNICAL AND REGULATORY TRENDS . . . REGULATORY TRENDS . . . HVAC . . . (CONTINUED)

- The Carrier representative interviewed to discuss heating systems noted ASHRAE 90.1 has almost no impact on the heating side — it's all in cooling. He said (and other furnace manufacturers agree) that “There's just not much difference between manufacturers — everybody's around 80-82 % AFUE” He went on to say “If there were an opportunity for much higher efficiency it might be an issue. In residential it is because you can offer a condensing furnace; in rooftop gas furnaces there's really no difference.”
- While Trane notes that refrigerants are not much of an issue, as long as R-123 can still be used, York feels that refrigeration is “a bit” of an issue.
 - According to York, “most clients don't really care one way or the other; all the major refrigerants that are out there are acceptable. One potential issue is that we're getting close to the HCFC 123 production caps, and EPA is even trying to speed up the phase-out of those. We're trying to convince them not to do that, since we're committed to a product line with that refrigerant. Trane opposes us (and Carrier) on that since they've built their product line around 132, which doesn't have those caps.”
 - York goes on to note that everybody's working on new refrigerants, and we have a full range of ASHRAE 90.1 and Energy Star compliant equipment. Standards kind of call attention to what we're already emphasizing.
 - McQuay offers that “environmentally friendly refrigerants don't trigger any chiller replacements, but most customers will go for the more green refrigerants when they do replace. Like everyone else, we do still offer some equipment that uses R-22 or 123, but we push the more environmentally friendly refrigerants.”

MANUFACTURERS . . . MARKET, TECHNICAL AND REGULATORY TRENDS . . . REGULATORY TRENDS . . . BOILERS

WHILE NOX REGULATIONS ARE A CONCERN NATIONALLY, THE WISCONSIN-BASED MANUFACTURER'S REPS INDICATED THAT THESE REGULATIONS ARE NOT AS BIG AN ISSUE IN WISCONSIN AT THE PRESENT TIME.

- “We know there's a lot of regulatory activity in California that's really driving the market there as far as low NOx boilers. We've seen a little of that here; not so much for individual units as for the fact that a facility might add a boiler and go over their allowed maximum emissions. We do have a number of low NOx units; it's something customers care about. We're always trying to push that envelope, because if you're the first, then it gives you hold on the market, because yours is now the best available technology and new installations pretty much have to use it.
- “Regulations really haven't affected us that much in Wisconsin, in part because we deal in the packaged boilers rather than the very large utility boilers. We do have a few non-attainment areas, but it just hasn't been a big issue for us.
- “Low NOx has been a big driver for product development nationally, but hasn't affected us in Wisconsin on either the commercial or industrial boilers we sell. In California they have to deal with that on every installation; same thing in Texas. On the industrial side, there's Nestle's headquarters in our territory and their view is being influenced by the fact that they have facilities in California.”

MANUFACTURERS . . . ROLE OF ENERGY EFFICIENCY . . . KNOWLEDGE

MANUFACTURERS' APPROACHES TO PROMOTING NEW PRODUCTS AND FEATURES (INCLUDING ENERGY EFFICIENCY) VARIES BY THE TYPE OF BUYER AND EQUIPMENT.

- According to one manufacturer, in some instances they approach the buyer directly, in others, they rely on distributors and contractors. Regarding knowledge of energy efficiency:
 - Most people are pretty knowledgeable these days, especially those that deal with larger systems.
 - Design engineers are usually knowledgeable about these issues, but they have no real incentive to explore them for their client, the owner. Their contract is for a fixed fee, and they get paid nothing extra for looking into and laying out the alternatives.
 - Contractors vary: C/I sector contractors are usually a little more knowledgeable about technical issues than residential, but not always; the best residential contractors are better than the worst C/I contractors. Usually the bigger players will have someone who is knowledgeable, but the smaller guys who do occasional commercial jobs may not have that much skill in it.
 - Ultimately you have to educate the owner to ask for those alternatives and that it's worth paying the design engineer for the extra time to check those out.
- Another manufacturer said that the sales reps know their product very well, and most of the contractors who work with engineered systems are also knowledgeable. For owners it depends on whether there is a technical person on staff. Manufacturers and large companies usually are pretty well informed.
- A third reiterated that, with the exception of some owners, most of the players in this market (large chillers) are pretty knowledgeable. There are some developers and office building owners who have very little, but larger organizations and especially industrial firms have staff who know about this stuff.
- Another noted that their reps are skilled and technically qualified; some contractors less so.

MANUFACTURERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . OBSTACLES . . . HVAC

IN ADDITION TO FIRST COST, HVAC MANUFACTURERS NOTE THAT ASHRAE 90.1 EFFICIENCY LEVELS ARE AT A LEVEL WHERE SHORT PAYBACKS ARE NOT OFTEN POSSIBLE. PRESENTATION OF ALTERNATIVE SOLUTIONS TO OWNERS WAS ALSO MENTIONED.

- Trane, Lennox and McQuay feel that first cost orientation, rather than capital availability, is a key obstacle to energy efficiency.
- Carrier sites the payback issue. Market efficiency levels are currently high enough that going above that doesn't necessarily meet a 2 or 3 year payback criterion, even though it offers a lower life cycle cost.
- York notes that, to the extent that the base is becoming 90.1, there really are few barriers to energy efficient chillers, since 90.1 is really state of the art.
- In addition, according to own representative, owners are not presented with alternatives in many instances.
 - “Architects, or designers, or contractors spec the basic system that will meet all relevant codes and the owner doesn't even know that there is a reason to consider anything else.”
 - “I had a chance to see this from the owner's perspective as head of the building and grounds committee when we did a \$1.5 million expansion to a school run by our church. In this case we selected a team of an architect, design engineer and contractor and told them they had to work together (which isn't always the case). They did a fine job of explaining the system the selected, but didn't say anything about there being alternatives available.”
- McQuay adds that plan and spec procurements almost guarantee that energy efficiency will get lost in the shuffle.

MANUFACTURERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . OBSTACLES . . . BOILERS

CONCERN ABOUT SHORT PAYBACK PERIODS, FIRST COST AND “SMOKE AND MIRRORS” ABOUT ENERGY EFFICIENCY CLAIMS ARE THE KEY CONCERNS OF BOILER MANUFACTURERS.

- “The short payback that customers demand is a big concern. When you require a one or two year payback, you loose out on a lot of potential savings.
- “First cost is definitely the biggest barrier, particularly for smaller commercial users, including schools and churches where they are subject to limited budgets -- although you'd have to say that applies to almost everyone.
- “I think the biggest obstacle is all the smoke and mirrors about energy efficiency. People don't know what to believe and how to evaluate what they're being told.”

MANUFACTURERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . SOLUTIONS

MANUFACTURERS RECOMMEND CONCENTRATING ON HIGH-POTENTIAL MARKETS FIRST, A SYSTEMS-LEVEL APPROACH, DOCUMENTED PERFORMANCE AND SAVINGS, AND A STANDARDIZED RATING SYSTEM.

- Trane notes that change has to come from the owners; the industry needs to get the rest of the market to look at it the way large industrial and institutional buyers do. Carrier agrees that “education and more education” is needed.
 - The system-level approach should be stressed.
 - Owners and others need to be educated about the importance of a more value-oriented approach. In addition, owners have to be educated to ask about alternatives, both in the equipment selected and in the way the entire system is integrated to work together.
 - The initial focus should be on institutional and industrial users, since they are more likely to have the owner involved and therefore be receptive to a value-oriented approach that includes energy efficiency. “Work with customers who are responsive now and try to apply the lessons they’ve learned to other sectors of the market . . . but that won’t be easy.”
- Lennox recommends extending the practices already used by national accounts into the rest of the market. McQuay feels that the best opportunities for energy efficiency are in design/build new construction.
- Guaranteed performance, rebates coupled with specific information on added cost and savings, and an effective rating system are potential solutions to the obstacles mentioned by boiler manufacturers.
 - “We used to guarantee the performance of our boilers; we'd tell people that if we missed a specified fuel-steam ratio we'd pay \$5,000 for each point we were off. That was very effective, and we never missed.
 - “Rebate programs seem like the best way to get at that directly, particularly if you can go to the owner with specific information on added cost, the extent to which the rebate offsets that, and their savings.
 - “Someone, maybe DOE, should develop commonly accepted rating systems and testing procedures.”

MANUFACTURERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . OBSTACLES

THE MAJOR SUPPLY SIDE BARRIER IS THE PRICE-DRIVEN SPEC AND BID PROJECTS. ONE MANUFACTURER MENTIONED, IN ADDITION TO LACK OF KNOWLEDGE, A LACK OF INCENTIVES TO USE KNOWLEDGE.

ACCA feels that there are generally fewer barriers to the contractors than to the end users. Utility programs and manufacturer efforts have made everyone at least somewhat aware of energy efficiency, even if the quantified benefits aren't that clear.

- Trane thinks that, in addition to competing on price, there are barriers both of actual knowledge and of a lack of incentives to use knowledge. Architects and some contractors may not be that knowledgeable about efficient equipment; design engineers and contractors who do have the knowledge don't have an incentive to apply it; contractors have to go with lowest first cost specs and designers don't want to spend extra time they don't get paid for.
- Carrier notes that low-cost spec and bid projects make it hard for a supplier to take the initiative with a higher efficiency piece of equipment.
- York doesn't really see any barriers, except to the extent that contractors have to respond to price-based solicitations. Lennox echoes the competitive pressure on contractors obstacle.
- Boiler manufacturers feel that key obstacles are first-cost driven specs and uncertainty about the equipment life of high efficiency equipment
 - “I think most suppliers do promote energy efficiency, but often they're faced with a narrowly defined spec and they have to meet that at the lowest cost. Contractors see a first cost-driven selection process so that's what they push, rather than quality or efficiency.
 - “Besides the efficiency definition issue, the biggest concern is the uncertainty about equipment life.”

MANUFACTURERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS

SOLUTIONS INCLUDE SYSTEMS THAT COMPENSATE ENGINEERS FOR LAYING OUT ALTERNATIVES, TARGETED EDUCATION, AND TEACHING SUPPLY SIDE ACTORS TO “SELL UP”.

- ACCA recommends giving contractors detailed information that they can use to sell, and try to get more owners to take a life cycle cost view of their purchase. NHRWA noted that training on how to sell energy efficiency would be useful.
- Trane argues that you need to educate owners to structure their deals with engineers so they get paid for laying out alternatives. “Money always gets people’s attention. But rather than giving rebates to the owner or contractor, if you have a program that helps cover the cost of extra design time by the design team to incorporate a more efficient system, that would let the more efficient system stand on its own merits.”
- In a similar vein, Carrier tries to encourage its sales reps to offer the low cost solution as well as a more efficient alternative with a lower life cycle cost. Carrier notes that it’s ultimately a question of raising the level of awareness throughout the market, for both owners and suppliers.
 - “If you can educate people until most everyone agrees that life cycle cost is in fact the way to go, it’ll become standard practice. Standards like ASHRAE 90.1 help in that they put a floor under what can be selected, but it still doesn’t change the way people think about these issues.”
 - “Anything that raises the level of awareness is useful. I don’t think just giving rebates gets you there; nor does standards. You have to get people to understand the value of the efficient system.”
- York notes that rebates are always good to get people’s attention; it doesn’t matter who you give them to, they ultimately ends up with the final buyer.

MANUFACTURERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS . . . (CONTINUED)

- Lennox encourages “teaching them how to up-sell”. The Lennox representative noted that: “There’s a rebate program that was in New Jersey a while ago where they gave the rebate to the distributor, which in our case would be the manufacturer. Rebate programs are most effective when they do rebates at the manufacturer level; instead of the contractor pocketing it, it lets our local sales offices go after the high efficiency business.”
- McQuay recommends more R&D on chiller technology.
- Rebates and demonstrations of reasonable paybacks are key solutions offered by boiler manufacturers.
 - “We’ll hear from our reps that there’s a local rebate program available, and that does get people’s attention – from owners to contractors and designers and our reps. And of course you need to provide information; show how the efficient system pays back.
 - “Rebates have been effective, really for all market segments, though they’re not needed very much for the larger customers. Giving incentives has certainly gotten the attention of owners as well as design engineers and contractors.”
 - NHRWA observed that rebates enhance the credibility of the energy efficiency message, but that “we haven’t seen that many of those lately”.

MANUFACTURERS . . . FOCUS ON ENERGY SERVICES

MANUFACTURERS AND MANUFACTURER'S REPS ARE VERY KNOWLEDGEABLE ABOUT ENERGY EFFICIENT HVAC SYSTEMS, AND WOULD MAKE EXCELLENT PROGRAM ALLIES.

- The only HVAC interviewees aware of Focus on Energy were the two Trane representatives, possibly because Trane is headquartered in Wisconsin. Trane's representatives felt that "Focus hasn't had a major impact as yet".
- While the boiler manufacturers and manufacturer reps are somewhat familiar with Focus services, none have participated to date, and one is a bit skeptical.
 - "I'm aware through a boiler we're installing for our church. Both the building and the boiler were too large under the standard terms of their program, but their engineers asked for some data and will let us know if it qualifies.
 - "We haven't participated, but they have made us a little more conscious. They may have encouraged us to add a more efficient line o our business. I'm not convinced that those programs are really in the customer's best interest though; they take one measure of efficiency and place that as the only criteria or the most important one above all others. And the costs of installations that qualify can be three times higher than a standard installation that runs about 83-85% efficient. We had one sale where we could have met the load with two boilers instead of the 5 they were looking at, and it would have saved them \$40,000 up-front. I doubt if Focus is giving them that much."

MANUFACTURERS . . . FOCUS ON ENERGY SERVICES . . . (CONTINUED)

- Demonstrations, personal contact, and a standardized tool for measuring energy use and savings are services that would be welcomed by the boiler manufacturers.
 - “If customers are aware that somebody in their industry is using a more efficient boiler, they'll be pushed to follow. We've done this at dairy industry shows in Madison, where we'll say, hey are you aware of this.
 - “I would really like to have someone from Focus on Energy come to us and tell us what's available. Maybe they could even go with us to visit a customer, so we can lay out what the benefits of the high efficiency system are and give them a bottom line analysis, including the role of any rebates. This would be particularly good for our smaller commercial customers.
 - “One thing I'd like to see is a standard measurement for looking at efficiency instead of going to three sources and getting three different answers. Having a tool or a guide that would allow both suppliers and customers compare efficiency in a consistent and meaningful way. That would be harder than it sounds, since everyone is going to want the definition of energy efficiency that makes them look better.”

A.4 DISTRIBUTORS

Exhibit A-4
Overview of Distributors Interviewed
(Sales Data are Sales in Wisconsin in Past Year)

Company	Focus Participation	General Information				Sales by Sector			Number of Units Sold				Retrofit Projects				New Construction Projects			
		Employees in Wisconsin	Outside Wisconsin	Total	HVAC Design as % of Total Business	Residential	Commercial	Industrial	Boilers	Furnaces	Chillers	DX Systems	Boilers	Furnaces	Chillers	DX Systems	Boilers	Furnaces	Chillers	DX Systems
TOTALS	4								1,327	13895	75	7,705	92%	66%	41%	82%	8%	34%	59%	18%
AVERAGE	40%	46	686	731	N/A	60%	33%	7%	133	1,390	8	771								
D2	Res/CI	100	100	200		90%	5%	5%		3,500		4,500		75%		100%		25%		
D9	Res/CI	95	45	140		60%	37%	3%		10	20	100		40%	30%	40%		60%	70%	60%
D1		90	15	105		60%	40%		1,000	4,500	5	250	95%	71%	100%	50%	5%	29%		50%
D3		75		75		60%	30%	10%	15	2,000	20	80	53%	60%	50%	38%	47%	40%	50%	63%
D7		33		33		85%	10%	5%		500		600		35%		70%		65%		30%
D4	Res/CI	30		30		70%	25%	5%	200	1,500		1,000	85%	70%		70%	15%	30%		30%
D10		23		23			75%	25%			30	60			33%	33%			67%	67%
D6	Res/CI	6		6		40%	40%	20%		800		800		20%		20%		80%		80%
D8		5	5,500	5,500		95%	5%		12	85		15	100%	49%		40%		51%		60%
D5		4	1,200	1,200		40%	60%		100	1,000		300	80%	65%		100%	20%	35%		

DISTRIBUTORS . . . INTERVIEWEES

AS SHOWN IN EXHIBIT A-4, THE 10 HVAC DISTRIBUTORS INTERVIEWED REPRESENT A BROAD SPECTRUM OF WISCONSIN'S HVAC DISTRIBUTOR POPULATION, BOTH IN TERMS OF THE NUMBER AND TYPES OF SYSTEMS SOLD. 10 OF THE 13 LARGEST DISTRIBUTORS IN WISCONSIN WERE INTERVIEWED.

- HVAC distributors are most active in the smaller HVAC units (furnaces and DX units). The 10 distributors interviewed sold 14,000 furnaces and 7,800 DX units in the past year, as compared to 1,300 boilers and only 75 chillers.
 - All of the distributors interviewed sell DX units and all but one distributor sell furnaces. In contrast, half of the distributors handle boilers, and only 4 of the 10 distribute chillers.
 - Most of the smaller types of equipment (DX units and furnaces) are handled by distributors, while much of the larger installations (of chillers and larger boilers) flow from the manufacturers and their sales agents through professional engineers, with some of the boilers going through plumbing distributors.
- Seven of the 10 distributors interviewed sell the majority of their equipment in the residential sector. One distributor — who handled 30 chillers in the past year — works entirely in the C/I sector.
- According to the distributors, retrofit applications are more prevalent than new construction applications for all HVAC units except chillers.
 - Ninety-two percent of boilers were sold in retrofit applications, as were 82 percent of the DX units and 66 percent of the furnaces.
 - In contrast, nearly 60 percent of the chillers were sold in new construction projects, with only one of the 4 companies that distribute chillers indicating that most of their work was in the retrofit market.

DISTRIBUTORS . . . INTERVIEWEES . . . (CONTINUED)

- The distributors operate in Wisconsin and adjoining states. In addition to Wisconsin, these distributors' territories include Northern Illinois (3); Minnesota (2); North and South Dakota, and the Upper Peninsula of Michigan (1).
- The distributors interviewed are not yet very active in Focus on Energy. One is an active participant in the C/I programs, while 3 other residential program participants are beginning to explore the C/I sector programs. Four of the other distributors were "vaguely" or "somewhat" familiar with Focus, while two had not heard of Focus.

DISTRIBUTORS . . . BUSINESS PRACTICES . . . DISTINGUISHING CHARACTERISTICS

WHEN ASKED, “WHAT PRODUCT FEATURES DOES YOUR FIRM MOST OFTEN EMPHASIZE IN THE MARKETING OF COMMERCIAL HVAC EQUIPMENT?” DISTRIBUTORS STRESSED PRODUCT QUALITY AND EFFICIENCY. ASSISTING SUPPLY-SIDE ACTORS DEMONSTRATE A LINK BETWEEN RELIABILITY AND HIGH EFFICIENCY PRODUCTS IS A POTENTIALLY PRODUCTIVE AVENUE FOR FOCUS PROMOTIONAL EFFORTS.

- The reliability of the equipment was mentioned by half of the distributors, with 4 of these noting that reliability was the most important product feature, with 1 also saying that solid warranties help sell reliability. Two other distributors noted that brand reputation was paramount.
- Efficiency was mentioned by half of the distributors, with 3 citing the efficiency of the units as their key marketing message. Another distributor mentioned that unique product features, such as state-of-the-art heat exchangers, are often stressed.
- Continuing with the quality theme, 3 distributors indicated that quiet-running equipment is important.
- Financial considerations were not mentioned by any of the distributors. Neither capital costs, operating costs, the availability of rebates, or the availability of financing was mentioned by any of the distributors.
- Establishing long-term reputations with their customers, through high-quality, reliable equipment and excellent customer service, was mentioned as the most important aspect of business success by all of the distributors. As one distributor said:
 - “We like to work on good customer relationships on a personal and professional basis to work together to achieve common goals.”
 - It is, of course, a key goal of Business Programs to operate in this manner.

DISTRIBUTORS . . . PRODUCT FLOW

DISTRIBUTORS PURCHASE NEARLY ALL OF THEIR HVAC EQUIPMENT FROM MANUFACTURERS AND MANUFACTURER REPS, WITH ALL BUT ONE OF THE DISTRIBUTORS INTERVIEWED SPECIALIZING ON ONE PRIMARY BRAND.

These distributors sell through HVAC and mechanical contractors in at least 90 percent of the cases, with 10 percent of the (larger, more customized) chillers sales made directly to the facility owners.

- Distributors that are affiliated with one primary manufacturers normally have designated regions to serve, and do not compete directly with other distributors of the same brand, although there is some overlap between regions.
- Generally, affiliated distributors (and their manufacturers) handle the larger systems, while the independent distributors are most active with the smaller systems. Some distributors have internal engineering staffs to support the larger systems, while others sell primarily to residential contractors who do a few commercial installations.

DISTRIBUTORS . . . PRODUCT FLOW . . . ANCILLARY SERVICES

ACCORDING TO THE NHRWA, MANY OF THE DISTRIBUTORS/WHOLESALERS HAVE TECHNICAL PEOPLE ON STAFF AND PROVIDE TECHNICAL ASSISTANCE TO CONTRACTORS AND THEIR TECHNICIANS.

- These distributors often have a separate sales/technical specialist for the light commercial market. Many of these specialists used to work for the manufacturers, since in the past manufacturers often had their own training force that would go around and, usually through the distributors, provide training. As manufacturers tried to drive down cost, they increasingly pushed that function on the distributors
- The light commercial specialist for the distributor will often help engineering firms or contractors develop a spec, particularly on design-build jobs. That allows them to influence the energy efficiency of the unit selected.

THE DISTRIBUTORS ARE EVENLY DIVIDED BETWEEN OFFERING STANDARD PRODUCTS AND CUSTOM SOLUTIONS, WITH FOUR OF THE DISTRIBUTORS OFFERING MOSTLY STANDARD PRODUCTS, FOUR OFFERING MOSTLY CUSTOM AND/OR COMPLETE SOLUTIONS, AND TWO OFFERING A RELATIVELY EVEN MIX OF STANDARD AND CUSTOM SOLUTIONS.

DISTRIBUTORS . . . TRAINING

AS MENTIONED PREVIOUSLY, DISTRIBUTORS, DESIGNERS AND CONTRACTORS INTERVIEWED OBTAIN TRAINING ON CURRENT HVAC TECHNOLOGIES AND TECHNIQUES PRIMARILY FROM THE MANUFACTURERS OF THE PRODUCTS THEY SELL. MOST OF THE MANUFACTURER TRAINING IS PUT ON BY THE AFFILIATED DISTRIBUTOR IN THE LOCAL AREA.

- At least some of the energy efficiency expertise among the distributors comes from their training efforts. All but one of the distributors interviewed indicated they had attended training in energy efficient HVAC systems.
 - Seven of the 9 said the training was provided by manufacturers, with two indicating they had attended residential sector Focus on Energy training sessions. One specifically mentioned ASHRAE training classes, and another distributor indicated most of the training was done internally.
 - NHRWA feels that manufacturers are the main source of information for distributors. This tends to be solid, reliable technical information.
- NHRWA also noted that distributors/wholesalers provide training and technical assistance to their customers — the contractors.

DISTRIBUTORS . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS

ACCORDING TO THE DISTRIBUTORS INTERVIEWED (WHO ARE OFTEN FARTHEST REMOVED FROM THE ACTUAL DECISION-MAKING PROCESS), COMPETITIVE BIDS ARE USED IN THE MAJORITY OF SALES EXCEPT FOR DX SYSTEMS, WHERE HVAC CONTRACTORS ARE MORE OFTEN INVOLVED IN SELECTING THE EQUIPMENT TO BE PURCHASED.

- Distributors reported that factors other than price are considered in competitive bids in between 5 and 15 percent of the cases (with the highest percentage for chillers and the lowest for boilers). This indicates that factors such as payback, product quality and reliability are important in at least some of the competitive bids.
- The distributors interviewed feel that HVAC/mechanical contractors are the key influencers of the type and efficiency of the HVAC equipment installed, cited by the distributors in at least 65 percent (for chillers) and as much as 91 percent (for boilers) of the HVAC installation decisions. These numbers are, of course, consistent with the high percentage of sales being made directly to contractors. Professional engineers are most important in the chiller decisions. According to the distributors, facility owners rely on their HVAC experts in the selection of HVAC systems.

DISTRIBUTORS . . . MARKET, TECHNICAL AND REGULATORY TRENDS . . . MARKET TRENDS

DISTRIBUTORS SEE ENHANCED UPSTREAM AND DOWNSTREAM RELATIONSHIPS AS AN IMPORTANT ELEMENT IN COMBATING THE INCREASINGLY COMPETITIVE COMMERCIAL SECTOR HVAC MARKET.

- Four of the distributors noted that the commercial market is becoming more and more price-driven, especially in the more standardized, smaller products.
- Exceptional customer service, high-quality products and quick response were mentioned as important ways to enhance market share.
- One distributor mentioned that manufacturer consolidation has “reduced what we see as a downturn in the commercial market”, and strengthened their relationship with their manufacturer. Another noted they stress the need for high-quality, reliable products to their manufacturer.

Exhibit A-5
Ratings of Knowledge of Energy Efficient HVAC Technologies and Resources
((1 = Not at All Knowledgeable; 5 = Very Knowledgeable)

Ratings By:	Sample Size	Ratings of:						
		Building Owners	Developers	Manu- facturers	Distributors	Design Engineers	Architects	Contractors
Distributors	10	2.1	--	4.1	4.2	3.6	2.5	3.1
Contractors	30	2.3	--	4.4	3.8	3.8	2.8	3.9
Design Engineers	10	3.1	2.1	4.6	3.5	--	3.3	3.6

DISTRIBUTORS, DESIGN ENGINEERS AND CONTRACTORS . . . ROLE OF ENERGY EFFICIENCY . . . KNOWLEDGE

AS SHOWN IN EXHIBIT A-5, HVAC DISTRIBUTORS, DESIGN ENGINEERS AND CONTRACTORS ALL RATED MANUFACTURERS THE MOST KNOWLEDGEABLE REGARDING ENERGY EFFICIENT HVAC TECHNOLOGIES AND RESOURCES, AND THE BUILDING OWNERS THE LEAST KNOWLEDGEABLE.

HVAC distributors, design engineers and contractors were asked “How knowledgeable would you rate each of the following players regarding energy efficient HVAC technologies and resources, using a 1 to 5 scale where 1 means not at all knowledgeable and 5 means very knowledgeable?”

- In fact, the design engineers were asked to rank both building owners and developers, and felt that developers were even less knowledgeable than building owners. Imparting knowledge of the benefits of energy efficiency to the people who write the checks continues to be an important challenge.
- Note that the rankings are relatively consistent across groups, with manufacturers followed by distributors, consulting engineers, contractors, architects and building owners. The only variation in this trend is where both distributors and contractors ranked their own staffs higher than did the other interviewees.

Exhibit A-6
Information Sources Used by Market Actors to Stay Current on HVAC Industry Developments

Information Source	Distributors	Designers	Contractors
Sample Size	10	10	30
Trade Journals	8	10	20
AC and Refrigeration News	2		2
ASHRAE	2	5	5
Contractors Business	1		8
Engineering Systems		3	4
Heating Piping and Air Conditioning	1	3	2
HVAC News	4	5	6
Mechanical Engineering			2
Plumbing and Mech'l Contractors	3	3	2
SMACNA			2
SNIPS Magazine			3
The Wholesaler	2		
Other	3	5	5
Manufacturers*	7	8	17
Trane	--	7	6
Carrier	--	4	6
York	--	2	3
Lennox	--		1
McQuay	--		3
Other	--	4	2
Industry Associations	1	5	8
ASHRAE	1	5	5
ACCA			2
Other			3
ASHRAE Conference	1	1	1
Internet	1	1	5

* Includes affiliated distributors

DISTRIBUTORS, DESIGN ENGINEERS AND CONTRACTORS . . . ROLE OF ENERGY EFFICIENCY . . . INFORMATION SOURCES

AS SHOWN IN EXHIBIT A-6, TRADE ALLIES RELY PRIMARILY ON TRADE JOURNALS AND THE MANUFACTURERS OF THE HVAC PRODUCTS THEY SELL TO STAY CURRENT ON HVAC INDUSTRY DEVELOPMENTS.

- Distributors rely primarily on trade journals and information from equipment manufacturers in staying current on developments in the HVAC industry, offering Focus with additional possible promotional levers. HVAC News was mentioned by 5 distributors, while 2 mentioned the ASHRAE Journal, another cited ASHRAE conferences and 2 mentioned The Wholesaler.
- All 10 of the designers interviewed use trade journals, primarily the ASHRAE Journal and HVAC News (5 designers each) to keep current on the HVAC industry. Engineering Systems, Heating, Piping and Air Conditioning and Plumbing and Mechanical Contractors were mentioned by 3 designers each. Manufacturers and their affiliated distributors are another popular source of information, with Trane and Carrier cited most often.
- Contractors rely primarily on trade journals (mentioned by 20 contractors) and information from equipment manufacturers and their affiliated distributors (18 contractors) in staying current on developments in the HVAC industry, offering Focus with additional possible promotional levers. Industry associations were mentioned by 8 contractors, and 5 contractors use the internet. The most popular trade journals were Contractors Business (8 contractors), HVAC News (6), the ASHRAE magazine (5), Engineering Systems (5) and SNIPS Magazine (3).

DISTRIBUTORS . . . ROLE OF ENERGY EFFICIENCY . . . PROMOTION

CONSISTENT WITH PREVIOUS OPEN-ENDED RESPONSES, 7 OF THE 10 DISTRIBUTORS INDICATED THAT THEY “ALMOST ALWAYS” TAKE STEPS TO PROMOTE ENERGY EFFICIENT EQUIPMENT, WHILE THE OTHERS INDICATED THEY PROMOTE ENERGY EFFICIENT EQUIPMENT “MORE THAN HALF OF THE TIME” (2) OR “ABOUT HALF OF THE TIME” (1).

- The distributor that promoted energy efficiency “about half the time” is the largest distributor surveyed, and appears to be more of a cost-conscious, mass-market type of firm than the other distributors. This distributor is not involved with Focus.
- Two of the 3 distributors that work with larger products (and have in-house engineering staffs) stressed working with their clients to find the best fit for their needs.

DISTRIBUTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . OBSTACLES

FIRST COST WAS MENTIONED AS THE MOST IMPORTANT BARRIER TO ENERGY EFFICIENT PURCHASES BY SEVEN OF THE DISTRIBUTORS, WITH THREE AGREEING THAT CAPITAL AVAILABILITY WAS AN ISSUE WHEN PROMPTED.

- Inadequate payback and lack of knowledge about the benefits of energy efficient equipment were each mentioned by three respondents. One distributor didn't see any obstacles.
 - As presented by one very large distributor: "It all comes down to the fact that less efficient is less money up front. If you can do a selling job on them and show them the payback over time they'll buy it. It's really important to educate the end users."
 - Another noted that: "There is a high demand for a low first cost. A lot of people are not looking at the life cycle cost in their decisions."
 - A third noted that: "Given the way the marketplace is right now, people are not spending money."
- First cost was also the primary obstacle mentioned by 8 of the 10 design engineers interviewed, with reliability and lack of familiarity with the latest technologies also mentioned.

DISTRIBUTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . SOLUTIONS

SOLUTIONS TO THE PROBLEMS CITED BY DISTRIBUTORS INCLUDE TARGETED EDUCATION (5 DISTRIBUTORS), BACKED UP BY CASE STUDIES (2), ALONG WITH INCENTIVES (4) AND FINANCING/COMMERCIAL LEASING (2).

- According to the distributors, both end users and supply side market actors (engineers, architects and contractors) need better education on the benefits of energy efficient solutions.
 - A “return on investment story” should be told, backed up by case studies packaged in easy to understand promotional materials.
 - This distributor noted that this “story” is much more valid for heating than cooling equipment in Wisconsin, as high efficiency heating has 2,500 full load hours compared to only 500 for cooling, a “flip-flop” from “down south”.
- Incentives are still important, as “contractors work on incentives and if you don’t give them any incentive to switch or go to more energy efficient equipment they are not going to do it”.
 - One distributor mentioned that a financing program would be needed to offset the higher first cost of energy efficient equipment, while another noted that “Given the market right now, the best thing that can be done is to make commercial leasing available because the companies are not spending the money”.

DISTRIBUTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . SOLUTIONS . . . (CONTINUED)

- Another noted that the current residential sector “cash back awards” through the Focus are working well to stir up interest in high efficiency equipment, and that some leveraging of the Focus incentives on the residential side may be occurring. “For instance if the utilities or WFE is offering \$150 on the product we are getting that number up to \$700. We work with the manufacturer and the dealer, and we all pitch in to make the number look more enticing because \$150, even though that's a lot of money, it doesn't catch them. But when you sit there and tell them it can be over \$700 bucks they say "Ahh, wait a minute!"
- This distributor went on to say, however, that “On the commercial all we can use is their rebate, because that particular business is so . . . cutthroat is the best way to put it. There is no money in it. WFE for commercial can only be a maximum of \$150 bucks, and that won't get anybody to jump. That's just a nice "thank you very much" for putting in the product, they get something for putting in the paperwork, and they get a little extra money.”
- Note that the distributor mentioned above called the “rebates” “cash back awards”. Another distributor also volunteered that the incentives should be called “rewards” rather than rebates.

DISTRIBUTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . OBSTACLES

DISTRIBUTORS DID NOT SEE AS MANY OBSTACLES ON THE SUPPLY-SIDE AS ON THE END-USER SIDE OF THE MARKET.

Lack of sales expertise/knowledge was mentioned by 5 of the distributors, and financial issues (first cost, capital availability and inadequate payback were mentioned by 4 of the distributors. Three of the distributors didn't see any obstacles on the supply-side, with one noting that "I think they are all willing".

- As one distributor said: "I think it's just the basic selling skills at the kitchen table or in the boardroom. You have to ask the customer about their needs and wants, make them aware of what's out there, and propose a system that will meet their needs and wants."
- Another noted that "Suppliers promote high efficiency 98 percent of the time. They are always pushing it, as they know it's the high-end dollar volume product, it costs the most and it works well. The problem is that both suppliers and end-users just don't have the money now to do it. They will maintain their current products but for them to jump into spending large amounts on money which can benefit them in the long run, very few are doing it. Some are, we just have to find them."
- A third noted that "One big barrier is oftentimes the user is exposed to the information by the general contractor or a builder. Knowledgeable people have to get to the end user to explain high efficiency."

DISTRIBUTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS

TARGETED EDUCATION (5 DISTRIBUTORS) AND SALES TRAINING (2) WERE MENTIONED MOST OFTEN AS SOLUTIONS TO THESE ISSUES. FINANCING/LEASING AND INCENTIVES WERE EACH MENTIONED BY 1 DISTRIBUTOR.

- Contractors, engineers and architects all need training on sales techniques, on “how to talk with the owners about the advantages of the equipment”. These should be directed sessions, conducted by proven professionals. Discussions of the global benefits of energy efficiency are not worthwhile. People need ammunition to sell the higher efficiency equipment.
- This could be backed up by financing through banks, commercial leasing programs and, of course, rebates.
- One distributor mentioned that Focus should “offer incentives to the dealers (i.e., contractors) to bring them into educational classes”. If not paying directly for the classes, have rebate availability directly tied to successful completion of the classes. Also, this distributor noted that “If they don’t attend the classes they don’t get the better price breaks on the equipment. We figure we have to spend x amount of time trying to educate these guys after the fact so we build this training into the cost of our equipment.”

DISTRIBUTORS . . . FOCUS ON ENERGY SERVICES

DISTRIBUTORS RECOMMEND MORE DIRECTED INTERACTION BETWEEN FOCUS AND HVAC SUPPLIERS

- While 4 of the distributors indicated they are active in the residential side of Focus, only 1 is active on the C/I side, with 3 others indicated they are beginning to investigate the services. Three of the nonparticipants indicated they are “familiar” with the program, 3 others are “barely familiar”, and 2 do not yet know about Focus. Sources of awareness are Focus staff (3), contractors (2), manufacturers (2) and word-of-mouth (1)
- Two of the distributors were very concerned about the process involved in interacting with Focus, and recommended centralization, streamlining and, very importantly, consistency over time. One distributor was particularly vocal about this, and offered constructive suggestions for improvement.
 - “We have tried to use the program without success, as we are still very unclear as to how it works. There appears to be multiple people working on different segments and we still can't figure out how you get involved, or who to talk to. Take the schools program for instance. We know the program has changed, but we don't know who the right guy to talk to about schools projects is. Also, there is a guy that does industrials, but if you're working with a big industrial there is another guy already assigned to the big industrials. Then, there's another guy that does compressed air systems that you're supposed to call.”
 - “There has to be a way to centralize the program. I own a rep business, and I sell a lot of different things, but my customer deals with the same sales guy whether he wants to buy a rooftop unit, and chiller, a condensed unit or a control system. When I call Wisconsin Focus on Energy, it's not just one guy, it could be one of ten guys, depending on the type of application. So there is really no way of developing a relationship with them because there are so many different people in so many different market segments.
- Another distributor voiced similar sentiments, noting that: “We worked with them but I don't think we were successful with any of the projects we tried. The process for working with them is complicated and sort of unclear, and the guidelines are unclear. This complicates the sales process and slows the process down.”

A.5 CONTRACTORS

Exhibit A-7
Overview of HVAC Contractors Interviewed
(Sales Data are Sales in Wisconsin in Past Year)

Company	Focus Participation	General Information				Sales by Sector			Number of Units Installed				Retrofit Projects				New Construction Projects			
		Employees in Wisconsin	Outside Wisconsin	Total	HVAC Contracting as % of Total Business	Residential	Commercial	Industrial	Boilers	Furnaces	Chillers	DX Systems	Boilers	Furnaces	Chillers	DX Systems	Boilers	Furnaces	Chillers	DX Systems
TOTALS	15	2,570		2,684				671	1,394	114	1,818	56%	41%	43%	44%	44%	59%	57%	56%	
AVERAGE	50%	86	3	89	77%	17%	54%	22	46	4	61									
P11	<5%	700	100	800	20%		60%	40%	50	50	15	30	50%	50%	33%	50%	50%	50%	67%	50%
NP7		300		300	75%	1%	50%	49%	30	5	3	100	67%	100%	33%	80%	33%		67%	20%
P8	1 Proj	200		200	40%	5%	40%	55%	30	100	2	150	83%	60%	50%	50%	17%	40%	50%	50%
NP11		150		150	100%		80%	20%	30	10	10	100	17%		50%	50%	83%	100%	50%	50%
NP3		150		150	75%	5%	40%	55%	40	30	10	50	88%	67%	90%	40%	13%	33%	10%	60%
P15	Part	130		130	95%	15%	70%	15%	2	100	2	100	50%	50%		50%	50%	50%	100%	50%
NP8		130		130	60%		85%	15%	100		5	200	33%			33%	67%		100%	67%
P13	2 Proj	100		100	80%		85%	15%	40		20	100	50%		25%	50%	50%		75%	50%
NP12		100		100	90%		80%	20%	20	40	3	50	50%	50%	100%	20%	50%	50%		80%
NP9		80		80	15%		60%	40%	3	6	4	6	33%	33%	50%	33%	67%	67%	50%	67%
P5	5%	75		75	100%		80%	20%	50	200	1	200	40%	15%		25%	60%	85%	100%	75%
P10	1 Proj	60		60	40%	20%	50%	30%	15	100		50	100%	80%		50%		20%		50%
P9	1 Proj	45		45	60%		95%	5%	50	5	5	100	20%	100%	20%	20%	80%		80%	80%
P4	1 Proj	35		35	90%		80%	20%	12	2	6	25	83%	100%	33%	100%	17%			67%
NP13		35		35	80%	40%	40%	20%	4		2	35	25%			20%	75%		100%	80%
NP14		30		32	100%	65%	25%	10%	2	24		20	50%	100%		100%	50%			
P3	10%	20		32	75%	1%	70%	29%	20	40		75	50%	20%		31%	50%	80%		69%
P7	3%	30		30	70%	15%	35%	50%	10	50	4	20	60%	40%		60%	40%	60%	100%	40%
P14	1%	28		28	100%	70%	20%	10%	50	400		50	100%	25%		70%			75%	30%
P6	Part	28		28	80%	2%	90%	8%	12		2	12	100%		100%	67%				33%
NP2		18		18	35%		70%	30%	22	6	10	25	36%	33%	30%	20%	64%	67%	70%	80%
NP4		18		18	100%		60%	40%	12	20		25	50%	25%		40%	50%	75%		60%
NP15		17		17	25%		20%	80%	2	30	4		100%	100%	100%					
NP6		16		16	100%	65%	35%		12	24		25	100%	92%		68%		8%		32%
P12	5%	14		14	100%	50%	50%			40		60		25%	50%	25%		75%		75%
NP5		14		14	100%	60%	20%	20%	20	50		30	80%	50%		50%	20%	50%		50%
P2	10%	12		12	100%				20	30		100	50%	27%		25%	50%	73%		75%
NP10		12		12	95%	80%	20%		1	12		25	100%	100%		100%				
P1	5%	12		12	100%		70%	30%	6			40	100%			75%				25%
NP1		11		11	100%	5%	45%	50%	6	20	6	15	50%	35%	100%	100%	50%	65%		

CONTRACTORS . . . INTERVIEWEES

THIRTY HVAC CONTRACTORS, HALF OF WHOM HAVE PARTICIPATED IN FOCUS, WERE INTERVIEWED IN NOVEMBER 2002. AS SHOWN IN EXHIBIT A-7, THE CONTRACTORS INTERVIEWED OPERATE PRIMARILY IN THE C/I SECTOR.

- Most of the contractors interviewed install boilers, DX systems and furnaces, and 19 of the 30 contractors interviewed install chillers.
- The 30 HVAC contractors interviewed are generally larger contractors, with an average of 90 employees; 9 companies have 100 or more employees, and 9 others have less than 20 employees. All but 7 of the companies operate out of a single location, and all but one (a large “full service mechanical and fire protection contractor”) operate entirely within Wisconsin.
- These contractors installed similar numbers of furnaces and DX units (approximately 1,400 and 1,800, respectively, in the past year), nearly 700 boilers and over 110 chillers. All but one of the contractors installed boilers in the past year, all but one installed DX units, 25 installed furnaces, and 19 of the 30 contractors installed chillers.
 - All of the contractors with 35 or more employees work primarily in the C/I sector, and 13 of the contractors operate entirely in this sector. Note in Exhibit A-7 that only 5 of the (smaller) contractors have the majority of their sales in the residential sector. On average, commercial sector sales are approximately twice industrial sector sales, with all but 4 relatively small contractors operating in both of these sectors.
 - Installations by the contractors interviewed are relatively evenly divided between retrofit and new construction projects. This is somewhat different from the distributor distribution, where retrofit applications are more prevalent than new construction applications for all HVAC units except chillers.
- Nearly all of the contractors indicated they operate within a 100-mile radius of their offices. Only 4 of the contractors said they serve the entire state.

CONTRACTORS . . . INTERVIEWEES

- Although the contractors interviewed are more active in Focus on Energy than the distributors interviewed, activity is relatively low. Only two of the (smaller) contractors indicated Focus projects account for as much as 10 percent of their C/I business, 3 more said that they use Focus for 5 percent of their installations, and others noted they have used Focus in “1 or 2” projects. Twenty-four of the 30 contractors are familiar with Focus.
- HVAC contracting accounts for 80 percent of these companies business on average; 11 of the contractors (including 8 of the 10 smallest contractors) concentrate solely on HVAC contracting, while 6 others indicated that HVAC contracting represented less than 50 percent of their revenues. The most common services other than HVAC contracting offered by these companies include plumbing (10 contractors), metals fabrication (primarily pipe fabrication, 9 contractors), piping services (4), refrigeration (2) and fire protection (2).
- The table from Phase I that illustrates the approximate distribution of HVAC contractors (by number of employees and sales) is presented below.

HVAC Contractors in Wisconsin, 2002

# of employees	# Estab.	% of Total Estab.	Total Emp.	% of Total Emp	Total Sales (millions)	% of Total Sales
1	724	24%	724	3%	78	3%
2 to 4	1,236	41%	3,508	16%	326	13%
5 to 9	559	19%	3,647	17%	383	15%
10 to 24	329	11%	4,744	22%	451	17%
25 to 49	91	3%	2,994	14%	372	14%
50 to 99	39	1%	2,393	11%	265	10%
100 to 249	15	0%	2,190	10%	442	17%
250 to 499	5	0%	1,750	8%	288	11%
Total	2,998		21,950		2,605	

Major Markets Supply Channel Study: Phase I—Evaluation Report

CONTRACTORS . . . BUSINESS PRACTICES . . . DISTINGUISHING CHARACTERISTICS

WHEN ASKED, “HOW DO YOU DISTINGUISH YOURSELF FROM YOUR COMPETITORS?” QUALITY OF WORK (12 CONTRACTORS), EXPERTISE OF STAFF IN OFFERING THINGS SUCH AS CREATIVE DESIGN SOLUTIONS (9 CONTRACTORS), AND THE REPUTATION OF THE FIRM (7 CONTRACTORS, MANY TIMES BASED ON LONGEVITY) WERE OFTEN MENTIONED.

While all of the contractors mentioned service in some form, only two customers specifically mentioned customer value, and only one contractor volunteered that the long-term benefits of energy efficiency was stressed in their promotional efforts (another indicated they stress energy efficiency or low cost, depending on the customer desires). Interestingly, only one of these contractors indicated it was a low cost provider. Representative comments included:

- “First of all I think the quality of the people we have – our people are all very service oriented. When I hire an individual to work here he has to have four distinguishable factors: technical competence, very good communication skills, team oriented, and integrity. I have a waiting list of employees that would like to come and work for me from the standpoint of I let them have a lot of freedom, they have their own customer base, which as a contractor I am in jeopardy. We put together custom preventative maintenance where we encourage the maintenance staff from a certain facility to become part of our team. We encourage them to work side by side with our service mechanic so that this individual is able to grow in his knowledge on how to service his piece of equipment and eliminate some service calls. Beyond that point we guarantee our customers a 2-hour response time in emergency situations. The only thing we have to offer our customers is service. We don't carry a brand, so unless we can provide the best possible service we won't get the work.”
- “We offer a greater variety of services. We service everything we sell, we have 24hour service, we offer the design, and we give them everything they need. And I don't think all the companies do that.”
- “It comes down to service and the creativity in the design phases. We like to specify energy efficiency in long term use of the HVAC equipment versus the first cost of the installation. We get burned quite a bit

because we're not the cheapest but if they actually analyze it we actually have a better system for long term efficiency."

CONTRACTORS . . . BUSINESS PRACTICES . . . STANDARDIZED VS. CUSTOM SOLUTIONS

NEARLY HALF (14 OF THE 30 CONTRACTORS INTERVIEWED) INDICATED THEY SPECIALIZE IN CUSTOM SOLUTIONS, WHILE ANOTHER 7 INDICATED THEY DO A MIX OF STANDARDIZED AND CUSTOM JOBS.

- Generally, the contractors specializing in custom solutions are the larger contractors (with an average of 124 employees versus 84 employees for those offering both custom and standardized solutions and 41 for those offering standardized solutions), but there are some exceptions.
 - Seven of the 9 contractors with 100 or more customers say they specialize in custom solutions, with one of the others indicating they “do both design/build and spec work”. The other contractor (with 150 employees) is a bit of an anomaly in this group, indicating that “everything is standard because everything we do is spec”.
 - While 5 of the 9 contractors with less than 20 employees do only standardized jobs, three others in this group indicate they specialize in custom solutions, with one noting that “We look at everything as being custom. It’s more and more of a comfort issue as opposed to just heating and air conditioning” and another saying that “We prefer the design/build type application where we get a project and we design it.”

• *CONTRACTORS . . . BUSINESS PRACTICES . . . STANDARDIZED VS. CUSTOM SOLUTIONS . . . (CONTINUED)*

- Some other selected comments provide an indication of the range of services offered.
 - The largest contractor interviewed noted that “We have a mechanical engineering department, offering design support and mechanical service. In fact, there isn’t anything that’s needed in the building mechanically that we can’t handle.”
 - Another noted “There are two sides to that. One, in the plan and spec market you're really stuck with what the engineer tells you to do. In design/build then yeah we try to customize the system as much as possible for the customer. And we also offer long-term service backup on the equipment. We do have an installation division, so we do installation on jobs, we do plumbing also, and we do temperature controls or building automation whichever way you want to put it.”
 - One of the contractors who concentrate on standard solutions operates under a conservative philosophy: “We really don't do custom units. We take what the manufacturers offer and install that to eliminate getting into work hassles. The minute you customize equipment you void the factory warrantee and we wouldn't want to do that.”
- Although the C/I portion of Focus on Energy is still in its nascent stages, there are indications that contractor responses to questions such as “Are your products standardized or customer tailored? Do you provide services in addition to equipment installation?” can provide an indication of the level of activity of contractors in Focus. Recall that the 30 contractors interviewed were equally divided between participating and nonparticipating contractors. Two-thirds of the contractors indicating they specialize in custom solutions are Focus participants, while two-thirds of the contractors indicating they install standard equipment are not program participants.

CONTRACTORS . . . PRODUCT FLOW

CONTRACTORS PURCHASE ABOUT HALF OF THEIR EQUIPMENT FROM MANUFACTURERS/MANUFACTURERS' REPS AND ABOUT HALF FROM WHOLESALERS (WITH MOST OF THE WHOLESALERS AFFILIATED WITH ONE PRIMARY MANUFACTURER. CONTRACTORS SELL PRIMARILY TO THE FACILITY OWNER AND GENERAL CONTRACTORS.

- The percentage of units purchased from manufacturers is higher for the (larger) chillers, and lowest for furnaces. Contractors note that the largest equipment (e.g., chillers) is most often purchased directly from manufacturers and manufacturers' reps, while the smallest types of equipment (e.g., small furnaces and boilers) are purchased from independent distributors.
- Contractors sell primarily to the facility owner (44 percent of the time) and general contractors (39 percent).
 - Most of the contractors said there were no real differences by type or brand of equipment. One said that higher efficiency equipment is more likely to be sold to the owners, another said that larger equipment is sold to the owner, while another contractor said that larger equipment is sold to the general contractor.
 - Lead-time was mentioned as an important factor by 7 contractors, especially in emergency replacements. (One contractor offered that planned replacements go through general contractors, while emergency replacements are more likely to be handled by maintenance staffs.) Another contractor noted that “you generally do a design/build working with the owner or developer, versus plan and spec work where we are bidding a lot of times to a general contractor who has the contract for the whole project.”
 - Contractors indicate that planned replacements are more common than emergency replacements, especially among the larger customers. Larger industrial and institutional facilities are more likely to plan their replacements, while smaller facilities (restaurants, for example) are more inclined to replace their HVAC equipment when it breaks.

CONTRACTORS . . . PRODUCT FLOW . . . TARGETED MARKETS

- Most (22) of the contractors interviewed do target specific market segments, with schools and government facilities, small commercial and hospitals and medical facilities the most popular segments. Certain contractors target technically advanced customers who are more likely to install high-end equipment.
 - Five of the contractors specifically target the local school and government market, with 2 others mentioning that they work in these markets when the opportunity presents itself.
 - Seven of the contractors say they operate exclusively in the small commercial arena (“We stay below a quarter million dollars, that’s basically below 40,000 square feet”, as one contractor put it.) Two of these contractors have 100 employees; the rest are smaller.
 - Hospitals are targeted by 3 contractors, and smaller medical facilities by 2 others. “We target picky customers,” one of these contractors said. “We do medical facilities, telecommunications, we have a large chemical plant. A lot of our customers are long-time service customers and they tend to be looking for quality over low price.”
 - Similarly, 5 other contractors said they work primarily with existing customers, and 2 others work with a series of established general contractors. “Typically we try to do design/build commercial and we have a lot of general contractors as customers” said one of these contractors.
 - Another group of contractors (4 in total) specifically targets the private sector, feeling this sector is more likely to invest in high-end systems than are institutional clients. “We target commercial customers,” one of these contractors said. “We also do telephone/utility. We do not do governmental or hospitals.”
- Eight of the contractors interviewed (including 4 with at least 100 employees and 4 with 25 or fewer employees) said that they did not target a specific market segment (“We deal with any type of customer, we don’t specifically target anybody”, the largest of these contractors said).
- As mentioned above, 7 of the contractors said that they specialize in smaller customers. While 3 others said they target large customers, most of the contractors deal with customers of all sizes. As one contractor put it: “Our companies are the largest to the smallest. We sell anywhere from a \$5,000 air conditioning system to systems that cost a few million.”

CONTRACTORS . . . TRAINING

SUPPORTING THEIR PURSUIT OF HIGH-QUALITY, REPUTABLE SERVICE, NEARLY ALL OF THE CONTRACTORS INTERVIEWED HAD SOME TYPE OF TRAINING PROGRAM, WITH THE MOST POPULAR BEING SEMINARS PROVIDED BY MANUFACTURERS AND/OR THEIR AFFILIATED DISTRIBUTORS.

Leveraging manufacturer/distributor and or union activities could be a productive path for Focus to enhance energy efficiency expertise on the part of HVAC installation and service professionals.

- 23 of the 30 contractors interviewed said their staffs attend manufacturer/distributor-sponsored seminars. Union apprenticeship programs were mentioned by 9 of the contractors (with the Sheet Metal Workers union mentioned the most often). Nine contractors also said they provided internal training, and 4 mentioned trade associations. Focus on Energy involvement is limited. One contractor mentioned ECW training, and another said he “went to a FOE walk-through of a high efficiency building.”
- Training emphasis varies greatly by contractor, with 5 of the contractors (including 3 of the largest) mentioning 3 different training sources and another 11 mentioning 2 sources. Only one small contractor (a Focus participant) indicated they did not have any formal training program. Generally, the larger contractors emphasize training more than the smaller ones, although there are exceptions. There are no differences in training emphasis among Focus participants and nonparticipants.
- The most vocal proponent of training said, “We attend all manufacturers local programs that are offered at the wholesale houses. We attend every manufacturer school that is available to us. And I try to rotate the guys through that to make it fair that everyone gets one major manufacturer school that's out of town a year.”

CONTRACTORS . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS

ACCORDING TO THE CONTRACTORS INTERVIEWED, COMPETITIVE BIDS ARE USED IN THE MAJORITY OF SALES, AND ARE USED MORE OFTEN IN NEW CONSTRUCTION PROJECTS THAN IN RETROFIT PROJECTS. ESTABLISHED RELATIONSHIPS ARE MORE IMPORTANT IN RETROFIT PROJECTS (WHERE THE INCUMBENT CONTRACTOR IS MORE LIKELY TO HAVE A RELATIONSHIP WITH THE DECISION-MAKER) THAN IN NEW CONSTRUCTION.

- Ten of the contractors interviewed said that the larger public sector projects are usually competitively bid, and 6 contractors noted that new construction projects are more likely to be competitively bid: “When the timeline is long enough they have time to do that”, said one contractor. Five noted that competitive bidding was standard practice on most jobs, and 4 others said that all plan and spec jobs are competitively bid.
 - Situations in which projects were not competitively bid included those where the contractors has established relationships with the customer (8 contractors, with 3 noting that this is more prevalent in the industrial sector).
 - Other situations in which projects are not competitively bid include referrals (4 contractors), design/build (3 contractors) smaller jobs (3) and replacements (mentioned by 2 contractors).
- One contractor’s comments summarized the general trends regarding competitive bids: “Government jobs will be competitively bid, and most large jobs will be. Anything that's over 5 or 6 hundred thousand dollars will be competitively bid. Probably 50 percent of the work that comes in at less than that will be competitively bid. Generally speaking, size and the type of organization are important. The bigger the organization, the more likely it is to be a bid job. The closer we are to the ownership and the more they see the value of someone they know who has done a good job for them in the past and so on, the less likely we’ll have to face a truly competitive bid.”

CONTRACTORS . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS

- Contractors were also asked “What factors do you think come into play when a customer is choosing among multiple bids?” Ten of the 28 contractors who responded to this question said that price was of paramount importance: “First would be price, second would be price, and third would be price”, said one contractor with 75 employees. Of the other 18 contractors, 13 felt that the contractor reputation was an important consideration, and 5 cited the quality of the product bid. Representative comments include:
 - “If it’s a smaller customer it's definitely who has the lowest bid. With industrial and larger customers, it's reliability of the contractor as well as cost.”
 - “Some of the issues would be the feeling that the bidders are good bidders. In other words, if a company gets a really low price from a non-established company they might be wary of that. It may well that a company has done work for someone before and if they get very close on a bid they will still be given the job even if they are not the lowest price.”
 - “A lot of our work is design build so we're not only competing against other contractors for price, it's type of systems being proposed. The efficiency of the equipment that we're proposing and then obviously price.”

CONTRACTORS . . . EQUIPMENT SELECTION . . . KEY INFLUENCERS/DECISION-MAKERS

WHILE CONTRACTORS CITE BUILDING OWNERS, A&E FIRMS AND CONTRACTORS AS THE “MOST IMPORTANT PLAYERS” IN THE HVAC EQUIPMENT SELECTION PROCESS FOR RETROFIT PROJECTS, A&E FIRMS AND OWNERS ARE CITED MORE OFTEN THAN CONTRACTORS IN NEW CONSTRUCTION PROJECTS.

- In retrofit projects, owners, contractors (general contractors and the interviewees themselves) and A&E firms were cited by 48, 48 and 46 percent of the contractors interviewed respectively. Plant engineers and management companies are important players primarily in emergency replacement situations.
- In contrast, A&E firms are cited most often in new construction projects (65 percent of the time), followed by owners (52 percent) and contractors (24 percent). Note that plant engineers and maintenance companies are not involved in the new construction decisions.
- One contractor noted that tenants are rarely involved in the purchase decision because “most tenants work out an arrangement with their management company that they (the tenant) will do the repairs on a piece of equipment but they are not responsible for replacing it if the equipment goes bad”.
- Again, one contractor provides a good synopsis.
 - “The owner's rep is the primary focus because he or she gives us their needs whatever they might be. For example:
 - .. ‘Energy costs are too high, we need better operating equipment.
 - .. ‘Cost is a real factor here, I need to get something installed but let's do it a lower cost
 - .. ‘This is a very critical piece of equipment. I need redundancy, I need for you to make sure this installation is a very good installation, take a very good piece of equipment, one where the parts are available.’

CONTRACTORS . . . EQUIPMENT SELECTION . . . KEY INFLUENCERS/DECISION-MAKERS . . . (CONTINUED)

- “We first and foremost listen to the customer, what they're asking for. After that, I pull together the necessary engineering, if it is a design/build project, which most of our projects are, to try and design something with the customer to meet their needs. Our part of this is to make sure we orchestrate everything and everything is pulled together so that the customer ultimately gets a project that he's given me a description for. If he's my established customer, my primary goal is to maintain a long-term relationship with that customer. We are very agreeable on any type of changes and trying to work things out with him, its not just a slam bang see you later. So all of our projects we get involved with that in mind: this customer is going to be with us for the next 20 years or so.”
- Consistent with other responses, a few contractors noted that larger customers are more likely to buy sophisticated, energy-efficient equipment, while management companies are generally considered low-cost seekers.
 - One contractor noted that “Your larger commercial/industrial people pretty much know what they want because they've been around and they know the good equipment that is out there. The lay commercial person, he is a one shot deal, he doesn't really understand it. Certain office buildings or restaurants, you're in a different sector of the business and you've got people that are selling less efficient equipment and lower grade equipment.”
 - And another stated, very succinctly: “Typically the landlord/management companies want the cheapest stuff available”.

CONTRACTORS . . . HVAC EQUIPMENT SELECTION . . . PREFERRED EQUIPMENT CHARACTERISTICS

EVEN THOUGH WISCONSIN HAS 10 TIMES AS MANY HEATING DEGREE-DAYS THAN COOLING DEGREE-DAYS, WISCONSIN'S HVAC CONTRACTORS ARE VERY KNOWLEDGEABLE (AND OPINIONATED) ABOUT BOTH HEATING AND COOLING SYSTEMS.

- When asked, “How do you define your market, in terms of the brands of equipment you sell?” 23 of the 30 contractors mentioned at least one of the five HVAC manufacturers, while only 8 of these mentioned manufacturers of heating equipment.
 - Of the HVAC manufacturers, Trane was mentioned as the preferred manufacturer by 8 contractors, followed by Carrier (5) and Lennox (4). In total, Trane was mentioned by 16 contractors, Carrier by 13, followed by York (5) Lennox (4) and McQuay (3 contractors).
 - Heating equipment manufacturers mentioned by the contractors included Patterson-Kelley (3), Weil-McClain (3), Burnham (2), Reznor, A.O. Smith and Slant/Fin (1 contractor each).
- While 17 contractors indicated they preferred one major HVAC brand, 7 others had no ties to any particular brand of equipment. Four of these contractors (and 3 others) noted that it's not possible to specify a brand of equipment in plan and spec jobs. Five contractors felt that many of their customers prefer their current brand (for serviceability and reliability considerations), while 6 other contractors volunteered that they often customize their systems according to customer need.

CONTRACTORS . . . HVAC EQUIPMENT SELECTION . . . PREFERRED EQUIPMENT CHARACTERISTICS . . . (CONTINUED)

LATER IN THE INTERVIEWS THE CONTRACTORS WERE ASKED IF THERE WERE CERTAIN TYPES OF EQUIPMENT THEY PREFER TO SELL, WITH PROBES FOR STATE OF THE ART VERSUS STANDARD, DIFFERENT OEMS OR TECHNICAL SPECIFICATIONS, AND ENERGY EFFICIENCY.

- While 12 of the contractors said they prefer to sell energy efficient equipment (there is more profit in these upscale systems), 3 of these contractors (and 13 contractors in total, said that using a well-known, reliable and serviceable brand is the most important aspect of their equipment selecting process. Twelve contractors noted that they would sell the customers whatever they want. Representative comments included:
 - Well known, reliable and serviceable equipment:
 - .. “Key considerations are serviceability, parts availability and technical support from the manufacturer. If I can get my way on those things then I look at cost and what is the best value for the customer. And then I look at availability. If it's a planned type thing that is probably less of a factor but if it is an emergency that's a big factor.”
 - .. “We prefer to sell (our) product line any time we can, if its cost effective and in the customer’s best interest. Both the distributors and manufacturers provide strong backing.”
 - Higher efficiency, but still reliable equipment:
 - .. We prefer to sell higher grade split systems for air handling and air conditioning and then the hydronic gas fired heaters. You end up with a better efficiency/operating system as well as a longer life vs. plopping a bunch of rooftops on the roof.
 - .. “Some of the guys prefer standard stuff but we like to sell the high efficiency stuff. We usually stay away from the top of top of the line stuff (96 percent efficiency) because it is usually kind of finicky and experimental and haven’t been proven in the field yet. We like to stick with the furnaces that

have been around for a while and try to stay away from experimental type stuff until its been proven it can be installed effectively.”

CONTRACTORS . . . HVAC EQUIPMENT SELECTION . . . PREFERRED EQUIPMENT CHARACTERISTICS . . . (CONTINUED)

- More standard, reliable equipment: “Basically we sell just standard and OEM. State of the art is hard to sell. It's not proven you know, it's good for the first 5 years and after 5 years it just starts breaking down and customers are coming back after us meanwhile, it was saving them money at first, now it's costing them money to fix it.”
- Similarly, contractors say that customers ask for reliable products (14 contractors) timely, high-quality installations (5 and 4 contractors respectively) performed by reputable contractors with the expertise needed to complete a professional job (8 contractors). Competitive pricing is, of course, important (4 contractors, with one of these mentioning that customers “after proper installation, ask if there are any rebates from utilities or manufacturers). Only three contractors volunteered that customers ask for energy efficient products. Comments included:
 - “Customers ask for a good price, long life, and something that does not need a lot of maintenance. They want something that works. Something that's not going to have to be repaired every two minutes.”
 - “I would say that the primary thing is that the installation goes well and the equipment works well. And that's pretty much what they are looking for. They do at various points ask for advice on various things. I would say energy savings isn't always the number one thing that they are looking for. Usually they are looking for comfort. I think the energy thing comes into play maybe a year or two years down the road. When they've got the equipment in, they are used to the comfort level, now they are trying to figure out how to save money.”
 - “I would say that the installation timeframe, after market service and ease of doing business with us are the most important things customers are looking for.”

CONTRACTORS . . . HVAC EQUIPMENT SELECTION . . . PREFERRED EQUIPMENT CHARACTERISTICS . . . (CONTINUED)

CONSISTENT WITH CUSTOMER DESIRES, CONTRACTORS MOST OFTEN STRESS THE RELIABILITY AND SERVICEABILITY OF THE EQUIPMENT WHEN MARKETING COMMERCIAL HVAC EQUIPMENT (14 RESPONDENTS). CONTRACTORS ALSO TEND TO EMPHASIZE THE CONTROLLABILITY OF THE HVAC EQUIPMENT, AND LONG-TERM ENERGY SAVINGS (6 CONTRACTORS EACH).

- A few contractors noted they “would prefer putting a piece of equipment inside the building rather than outside the building because the life of the equipment is a lot longer if the equipment is taken care of inside. You have a tendency to get much more quality as far as service goes with a piece of equipment that is inside the building because the service mechanic takes his time. If its snowing or raining outside he wants to get off the rooftop as fast as possible, so many times screws are left out of the unit. As a result of that the wind is able to get under those panels and cause damage to the controls, and snow is able to blow inside. So the service is much higher on a piece of rooftop equipment.”
- “As far as the boilers (which would typically always be inside) we prefer a hot water system opposed to a steam system because of the simplification of maintaining a hot water system. We would prefer not putting in, in the case of a furnace, an extremely high efficiency furnace, like 90 plus furnace, because the service problems you have on a 90 plus furnace are much higher than a 80 plus furnace. I will tell the customer you will save an extra 10% on fuel savings here but you will easily use that up because the furnaces have become much more complicated to maintain.”
- Another contractor noted that “The controllability of the system is very important. If it is a sophisticated system, then you can control it. A lot of it depends on if we are making a determination, it's generally on a design/build project, and a lot of times it is a matter of feeling out the customer to decide what the customer wants. You can do a design/build project and still have a customer who wants a very low-end mechanical system. Or you might have a customer that wants a very high-end mechanical system and they need clean room facilities and things like that. It's a pretty broad spectrum and a lot of it is based on customer needs.”

CONTRACTORS . . . ROLE OF ENERGY EFFICIENCY . . . PROMOTION

WHEN ASKED SPECIFICALLY “HOW, IF AT ALL, DOES ENERGY EFFICIENCY FIT INTO THE TYPES OF EQUIPMENT YOUR BUSINESS PREFERS TO SELL?” 18 OF THE 30 CONTRACTORS SAID THAT THEY PREFER ENERGY EFFICIENT EQUIPMENT.

Fourteen of these 18 contractors indicated they “almost always” promote energy efficiency in sales situations and the other 4 said they promote energy efficiency “more than half the time”. Another contractor noted that energy efficiency is important in “applications where they'll have high operating costs, like a computer lab where the unit is going to be running 10 months out of the year instead of 6 months or 4 months out of the year.” One contractor felt that reliability was more important than energy efficiency, 9 contractors said they did not stress energy efficiency and one said, “energy efficiency doesn’t enter into equipment selection, I’m sorry to say.” Interesting comments included:

- “Well that is always our goal. I try to find a balance by saying if I can get a unit that operates at a higher efficiency than what the customer has been normally operating that is a real determining factor. But it has to be align with my other criteria of how available the parts can be, and how convenient is it to get the service of information on this type of unit- all those things are very important as well. In the case of one really efficient boiler, but the customer pays through the nose to maintain that system once it has been installed so therefore I would prefer not to recommend that. I would prefer to recommend something that is equally as efficient or slightly less efficient to make sure that the customer is really happy with the product that he has.”
- “I think unfortunately it plays a smaller role than we'd like it to. I think energy is relatively cheap. We had some real interest in energy costs in January or February of last year when the cost of gas went up so much. It faded away really quickly when the cost of gas came down again.”
- “We try to stress the efficiency. The best I could say is probably right now you can maybe up-sell yourself 20 -25% of the sales because of efficiency, but it is still a hard sale to people because they're still looking at the bottom dollar because of the way times are. It's tight you know.”

CONTRACTORS . . . ROLE OF ENERGY EFFICIENCY . . . PROMOTION

- When asked, “What aspects of energy efficient HVAC equipment do you stress in your promotion efforts” contractors were more likely to stress boiler efficiency (7 contractors) than HVAC efficiency (3 contractors). The systems often have heat exchangers, variable speed drives, and/or digital controls, and must be reliable and, of course, cost effective.
 - As one contractor said “We stress the systems that we believe work and are cost effective (boilers, control systems, some heat pumps and floor heating). We don't stress high efficiency air conditioning, for example, because in many applications in Wisconsin it isn't used that often and the equipment is significantly more expensive so the payback isn't there.”
 - Those who promote energy efficiency at least half the time cite obstacles such as specifications in bids and desire for the lowest first cost. One contractor noted “If you have alternatives a lot of times you are barred from presenting those by the bid form” and another felt that customers “are going to pay more per year for energy but stress lowest first cost to meet that initial budget crunch”.

CONTRACTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . OBSTACLES

COST WAS MENTIONED AS THE KEY OBSTACLE BY 23 OF THE 30 CONTRACTORS, WITH A FEW NOTING THAT OSCILLATING ENERGY COSTS ALSO PLAY A ROLE IN END USER INTEREST IN ENERGY EFFICIENCY.

- The cost issue is especially important in competitive bid situations. One particularly vocal contractor felt that “An important fact is that when contractors like us are bidding through general contractors or architects we don’t get the opportunity to provide the owner with the right information to make an educated decision based on energy efficiency. It comes down to price only then. For example, if we are bidding to general contractors that are bidding against other general contractors they're worried about price. They want us to provide them with the cheapest price and stand behind the system because that gives them an advantage to be the lower price overall, therefore getting the job. If we come in with options for higher first cost systems, but higher energy efficiency, they don't even look at them. They want the low first cost. The bidding scenario creates that.”
- Furthermore, and very importantly, advocates of energy efficient solutions need to get to right people at the right time.
 - One contractor noted that “You need to get in ahead of the construction process. Too often the energy efficiency isn't thought of until further down the line in the project so it's too late to change it. So owner education is very important; general contractors aren't necessarily speaking energy efficiency.”
 - Another contractor stated, very simply, that “The object is to get more negotiated rather than bid plan/spec work”.
- Some (4) contractors mentioned reliability and start-up issues. As one said “Manufacturers sometimes have a tendency to get the equipment out the door and not to support the people in the field successfully enough to prevent the problems of getting the systems up and running. Many times that is a cost factor to the contractor or a cost factor to the owner down the road to make the repairs necessary to make the equipment not only efficient but reliable.”

CONTRACTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS . . . SOLUTIONS

THE MAJORITY OF THE CONTRACTORS FELT THAT COMMUNICATION WITH THE KEY DECISION-MAKERS ON THE PAYBACK/RETURN ON INVESTMENT OF ENERGY EFFICIENT SOLUTIONS IS THE BEST WAY TO OVERCOME THESE OBSTACLES.

- Representative comments included:
 - “Tell people what their payback is going to be, whether its because of direct HVAC savings or because you can use the system to reclaim process heat and reuse some of what the plant is producing for heat. You need to sell them on why they’re spending more money up front.”
 - “Identify and empower people who believe that energy efficiency makes sense. You guys are trying, so I’ll give you that.
- Reducing the cost of the manufacture, installation and servicing of the systems was recommended by a number of contractors. Methods included better communication between manufacturers and the contractors in the field so that systems can be simplified, better internal education and training in the contractor ranks, and “cutting the deadweight overhead” at manufacturer and wholesaler companies was recommended by a number of contractors.
- One contractor recommended a shared savings approach to “buy down” high first costs, and 7 contractors felt that rebates were still important, with one noting that “In Wisconsin there is a fund that you can go to although it takes a lot of energy to do that”.

CONTRACTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . OBSTACLES

CONTRACTORS, LIKE DISTRIBUTORS, SEE FEWER OBSTACLES ON THE SUPPLY-SIDE THAN ON THE END-USER SIDE OF THE HVAC MARKET.

- In fact, 9 contractors thought there were no real obstacles to selling energy efficient equipment, with the most vocal saying “I don't really see any obstacles. It's a real no brainer. Our climate really dictates the efficiency of equipment. Wisconsin is known to sell the most high efficiency equipment in the USA because of our climate.”
- Most of the other contractors did not, however, agree with this assessment, with 6 noting that the demand is not there, and 7 others citing the high price of energy efficient equipment as the key obstacle. Taking the time to successfully promote energy efficient products was also mentioned.
 - “The market isn't there so they tend not to stock high efficiency equipment. When it's not stocked, if you've got a choice of buying standard equipment that you can get in week or buying higher efficiency equipment that you can get in month, a lot of times the decision is made right there.”
 - “If 90 percent of my revenue comes from non-high efficiency it would be hard for me to devote more than 10 percent of my resources to high efficiency. For me as a business owner, I am putting myself as the distributor, if the majority of my process come from non-high (low) efficiency equipment it's hard for me to budget money for high efficiency stuff.”
 - “I see it mainly on the architectural/engineering end. They don't really design systems for energy efficiency. I know of one engineer in the state of Wisconsin that really promotes it. Like I was saying, his jobs cost twice as much on the front end, but he saves it on the back end and it pays for itself in the long run. The energy costs come down - that's where the people are seeing the benefit.”

CONTRACTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS

THE PRIMARY RECOMMENDATION FOR OVERCOMING THESE OBSTACLES IS BETTER EDUCATION AND MARKETING TO BOTH END USERS (10 CONTRACTORS) AND THE GENERAL CONTRACTORS (4 CONTRACTORS). IN THE WORDS OF THE CONTRACTORS:

- “You got to get to the customer and my theory is that FOE, their situation is to try and get our customer base understanding more about energy efficiency. Because when we're going in there we've got 10 minutes to try and explain how they can save. (You) people have years to try to explain energy efficiency to them, we have 10 minutes . . . and we have to get a price to them at the same time.”
- “First you off you have to get the (general) contractors more knowledgeable and then they would go to the owners of these businesses and give them a little explanation before they even saw us. If you get the general contractors more involved, that would be a big plus. We'd get more people contacting us about energy efficiency. And, if they don't know, maybe the general contractor got rolling on the subject of energy efficient equipment. See a lot of contractors aren't knowledgeable on that whatsoever.”
- “Get the general contractors to embrace the more efficient equipment and selling it to the end user. Talk to the contractors and explain the advantages and paybacks for the equipment. Train the contractor so they can tell to tell the end user this is the way to go.”
- “Educate the consumer. They need to hear from other than the salesperson. Or educate the wholesaler that's coming in so that when the consumer contacts a fellow like me they already know they want a 12 or 13 SEER unit. And the Internet helps at this point.”
- “Advertising and technical explanations – I think they're most effective because people actually can see how good the new equipment can actually be. They have to see it to believe it.”
- “We need incentives that catch the buyers' eyes. It's just like anything else; cost is a big factor in this economy right now. So if you can fill up holes between energy saving and first cost with some kind of a rebate that catches their eyes.”

CONTRACTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS . . . (CONTINUED)

RECOMMENDATIONS FOR “SPECIFIC PROGRAM FEATURES THAT BE MOST EFFECTIVE IN HELPING YOUR COMPANY PROMOTE ENERGY EFFICIENT HVAC EQUIPMENT TO COMMERCIAL AND INDUSTRIAL CUSTOMERS” WERE WIDESPREAD.

- Contractors noted, and appreciated, the difficulties of changing the marketplace.
 - “Well you almost have to have an education in energy efficiency and then you have to be able to preach to your people that want to buy it. I mean everybody is energy conscious, there's no question about that, but how to get to that point is very difficult.”
 - “It is a hard battle for them to win. It is a long, long, long-term type thing. Things are taking off a little bit more because customers look at their bills and say ‘Holy Cow blah, blah, blah it used to never be that high’. The same lights are on, but they're buying different bulbs, better more efficient bulbs.”
 - “Cost is the biggest thing. Whenever a building is over budget, the architects do not like to change the exterior façade. Usually the first thing that gets cut in building that is over budget is always mechanical equipment. So you gotta make the stuff competitive.”
- Even though Focus faces a difficult task, simplifying things as much as possible for their program allies and targeted customers would make the task easier for all parties.
 - “If they are offering rebates or whatever to promote the equipment make it as easy as possible for the end user to apply for all this stuff and not have to go through a lot of red tape to get it.”
 - “There’s too much paperwork. Sometimes in the past you had to spend a lot of administrative time filling out paperwork for a \$25 rebate and that doesn't work. It costs you more to fill out the paperwork than the dollars you can pass back to the customer.”

CONTRACTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS . . . (CONTINUED)

- “Recently we've been getting a lot of information from them that I think is great. I'd like to see more classes and instructions on how to fill out their applications. Like if they told us exactly what they were looking for, like a study grant, it would be very helpful.”
- A number of contractors recommended a simple method for estimating energy savings and payback.
 - “One thing I've actually talked to their people on is giving us some software to be able to do some calculations on payback and energy usage on different types of equipment, because that's what the customer looks for. I have had customers ask me how much will it cost to run your system and I don't have the software here to do that. We usually have to direct them to a utility company for that. We'd like to have that ability in house so that we could work with the customer and try to sell them on more efficient systems. Either on a web site or software that we can purchase. I've asked them is if they have any software available and the young lady I spoke with said ‘Well we don't have anything coming up, if we do we'll contact you’ and that was quite some time ago.”
 - “I am only comparing this to the residential product which is simple, its much simpler and I understand that some of this might not carry over but with commercial/industrial there has to be some kind of simple process that lets you know the potential savings.”
 - “An easy to calculate energy savings device is needed. A lot of times a person will say "Okay I've gotta spend more for this unit, now what's the payback?" And then you have to sit there and calculate; it's hard to do. If you have brochures that spell it out very easy to understand, it would be easier to sell this stuff.”

CONTRACTORS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS . . . (CONTINUED)

- Persistence is necessary.
 - “I'd like to see them have more contact with us, try to promote the different ways they can work with us on different projects. If we don't think of contacting them they don't contact us. They send out a lot of stuff in the mail but if you don't understand exactly what it is they're giving you, there's no follow up.”
 - “If they are going to promote to any market it would be to the building owners and architects so that they're aware of what's available and they can bring it up across the board. Because if only one contractor out of a group that's bidding any one project brings it up, it's going to be swept under the carpet real quick.”
 - “Based on what FOE is trying to do, education of the contractors and direct partnership with them to promote their ideas directly to the owners rather than through consulting firms or outside firms.”
- The need/desire for continued financial incentives was expressed by 19 contractors (12 recommending continued customer rebates, 3 preferring rebates direct to the contractor (as they do all the work and a lot of the promotion), 6 wanting a simpler rebate structure, and 2 recommending financing). The current efforts are appreciated, and, in the opinion of many, should be continued. Quoting one contractor: “I'd just like to say that I am very pleased that there is an avenue for us to give incentives for our customers to save energy. Many projects are border line projects that may not go through but with the rebates that are available through FOE it kind of puts things a little bit more obtainable for someone to go ahead and get done.”

CONTRACTORS . . . FOCUS ON ENERGY SERVICES

BUSINESS PROGRAMS HAS BEEN MOST ACTIVE WITH HVAC CONTRACTORS. CONTINUED EFFORTS WILL BE APPRECIATED.

- Although, as mentioned previously, the contractors interviewed are more active in Focus on Energy than the distributors interviewed, the current level of activity is relatively low.
 - Two of the (smaller) contractors indicated Focus projects account for as much as 10 percent of their C/I business, 3 more said that they use Focus for 5 percent of their installations, and other 10 participating contractors noted they have used Focus in “1 or 2” projects.
 - Twenty-four of the 30 contractors are familiar with Focus. The most common sources of awareness were direct contact from Focus staff (6 contractors), the newsletter (6 contractors) and word of mouth from other contractors (4 contractors), indicating that the potential benefits of the program are spreading in the HVAC contractor community.
- As one contractor said: “I would say that FOE is starting to meet the needs of contractors such as myself. I recently attended a round-table discussion that was sponsored by one of the local interview places here, and they were asking questions geared toward what do they need to do to make FOE more available to help you get these jobs/work with you. So I see a steady improvement on what FOE is striving to do.”

A.6 DESIGN ENGINEERS

Exhibit A-8
Overview of Design Engineers Interviewed
(Sales Data are Sales in Wisconsin in Past Year)

Company	Focus Participation	General Information				Sales by Sector			Number of Projects				Retrofit/Renovation Projects				New Construction Projects			
		Employees in Wisconsin	Outside Wisconsin	Total	HVAC Design as % of Total Business	Residential	Commercial	Industrial	Boilers	Furnaces	Chillers	DX Systems	Boilers	Furnaces	Chillers	DX Systems	Boilers	Furnaces	Chillers	DX Systems
TOTALS	6						78%	22%	108	97	63	189	54%	32%	35%	34%	46%	68%	65%	66%
AVERAGE	60%	97	62	159	46%		78%	22%	11	10	6	19								
P5	1%	400		400	10%		60%	40%	30	30	15	60	77%	10%	47%	10%	23%	90%	53%	90%
NP4	None Yet	200	200	400	70%		80%	20%	5	5	10	20	40%	100%	20%	75%	60%		80%	25%
P6	1 Project	176	20	196	10%		90%	10%	5	1	2	6	80%		100%	67%	20%	100%		33%
NP1		110	390	500	15%		100%		5		2	2					100%		100%	100%
NP3		50	10	60	10%		20%	80%	2		2	12				25%	100%		100%	75%
P3	5 Schools	20		20	60%		100%		3			6	100%			100%				
P1	1 Project	9		9	70%		80%	20%	40	50	15	50	50%	40%	33%	40%	50%	60%	67%	60%
P4	2 projects	4		4	85%		80%	20%	10	6	12	12	50%	50%	50%	50%	50%	50%	50%	50%
NP2		2		2	95%		80%	20%	5	1	5	15	20%			33%	80%	100%	100%	67%
P2	1 Project	1		1	35%		95%	5%	3	4		6					100%	100%		100%

DESIGN ENGINEERS . . . INTERVIEWEES

TEN DESIGN ENGINEERS WERE INTERVIEWED IN DECEMBER 2002. AS SHOWN IN EXHIBIT A-8, THESE DESIGNERS OPERATE ENTIRELY IN THE C/I SECTOR, WITH COMMERCIAL SECTOR DESIGN MORE PREVALENT THAN RESIDENTIAL SECTOR DESIGN FOR ALL BUT ONE OF THE FIRMS INTERVIEWED.

- While the largest of the design-engineering firms (in terms of number of employees) and 5 smallest firms operate entirely in Wisconsin, 2 firms work across the Midwest, and two others have national practices.
- Eight of the companies are primarily design firms, while 2 provide architectural services as well. Other services offered include plumbing engineer (5 firms), electrical design (3), piping, lighting or industrial design (2 firms each) and metal fabrication (2 firms).
- HVAC designers are relatively more involved with the larger units (boilers and chillers) than are distributors or contractors.
 - The 10 designers interviewed had 108 projects that included boiler design and 63 with chillers, as compared to 97 projects with furnaces and 189 with DX units.
 - Seven of the 10 distributors interviewed sell the majority of their equipment in the residential sector. One distributor — who handled 30 chillers in the past year — works entirely in the C/I sector.
- New construction projects are more prevalent than retrofit/renovation projects for 5 of the firms, one specializes in renovations, and the other 4 operate in both the new construction and renovation markets.
- These designers are more active in Focus than and other market actor group interviewed. Nine of the 10 designers have heard of Focus services, 6 of the firms have participated in Focus projects, and one more is “on the verge” of beginning a project with Focus.

DESIGN ENGINEERS . . . INTERVIEWEES . . . (CONTINUED)

- While it is not possible to identify the number of HVAC designers from secondary sources such as D&B, the Phase I report for this project identified “design and service” firms. This table is presented below as an indication of the size of the design engineering market.

HVAC Service Firms in Wisconsin, 2002

# of employees	# Estab.	% of Total Estab.	Total Emp.	% of Total Emp	Total Sales (millions)	% of Total Sales
1	100	41%	100	8%	10.0	14%
2 to 4	81	33%	208	16%	11.2	16%
5 to 9	34	14%	207	16%	11.5	16%
10 to 24	19	8%	284	22%	23.5	33%
25 to 49	4	2%	132	10%	13.7	19%
50 to 99	2	1%	105	8%	2.2	3%
100 to 249	2	1%	250	19%	0.0	0%
Total	242		1,286		72.1	

Major Markets Supply Channel Study: Phase I—Evaluation Report

DESIGN ENGINEERS . . . TRAINING

DESIGNERS ARE MORE LIKELY TO ATTEND ASHRAE AND UNIVERSITY-SPONSORED SEMINARS THAN ARE THE OTHER MARKET ACTORS INTERVIEWED.

- While 5 of the 10 designers attend manufacturer-sponsored training, 5 attend ASHRAE seminars, and 3 cited University of Wisconsin.
- Designers were divided as to the most useful kinds of training. ASHRAE, the University of Wisconsin and in-house training were cited by two designers each. Manufacturer training and the ASHRAE show were cited by one designer each. Some comments were:
 - “Typically I find the 3 or 4 day seminars the most useful. Usually those are through ASHRAE or the U of W in Madison.”
 - “The training seminars at the university are excellent. They deal with general engineering principals and knowledge and allow us to make good design decisions and equipment selections. They are not simply relying on the manufacturer's sales claims.”
 - “Self-training is best because we are two steps ahead of all the training manuals in this operation here.”
 - “The ones provided by our vendors, our equipment manufacturers are the most useful. They know better than any body how to apply their equipment and how their equipment works best within a system.”

DESIGN ENGINEERS . . . EQUIPMENT SELECTION . . . CONTRACTING ARRANGEMENTS

DESIGNERS WORK ON PROJECTS THAT WILL BE COMPETITIVELY BID (DESIGN/BID/BUILD) PROJECTS MORE OFTEN IN NEW CONSTRUCTION THAN IN RETROFIT/RENOVATION PROJECTS (62 VERSUS 53 PERCENT). THE MAJORITY OF THEIR OTHER PROJECTS ARE DESIGN/BUILD. THE SIZE OF THE PROJECT AS WELL AS THE TYPE OF BID INFLUENCES THE QUALITY OF THE EQUIPMENT INSTALLED.

- “The design/bid arrangements tend to be a little higher quality equipment. That is where chillers and boilers are being specified. Whereas on the design-build format we are tending to go more with packaged equipment – packaged DX, packaged rooftop equipment, things of that nature. A lot of this is cost driven. The owner wants a low front end cost building that just meets his needs and doesn't care about a long life expectancy.”
- “Sometimes in the lower dollar design/build jobs you don't always get the best equipment, the highest grade of equipment.”
- “There is probably a big difference there in the type of equipment. In smaller projects you generally use more of the furnace or rooftop type equipment. When you start getting into the bigger clients you have a more educated staff and they are going to try and stay away from the short life furnace and rooftop units.”

DESIGN ENGINEERS . . . EQUIPMENT SELECTION . . . KEY INFLUENCERS/DECISION-MAKERS

ALL 10 OF THE DESIGNERS INTERVIEWED SAID THEY ULTIMATELY WORK FOR THE BUILDING OWNER, WITH 4 DESIGNERS MENTIONING THAT THEY WORK THROUGH ARCHITECTS, AND 4 OTHERS WORKING THROUGH GENERAL CONTRACTORS. FOUR OF THE DESIGNERS MENTIONED THAT THEY SOMETIMES COME ACROSS BUILDING OWNERS THAT ARE WED TO A PARTICULAR BRAND OF EQUIPMENT, ESPECIALLY IN RETROFIT AND (TO A LESSER EXTENT) RENOVATION PROJECTS.

- One designer covered all the bases. “The engineers working on the project have influence on equipment selection, so does the person managing the project. The architect sometimes has some influence and the owner/user has some influence too.”
 - “The engineer will work with something he's familiar with and feels is best for the application — for sizing, capacities — and they have a lot of influence in that area.”
 - “The manager sometimes has some influence too, anticipating what the owner might want and what the project can support cost wise.”
 - “The architect, as far as trying to achieve the level of quality he would like to maintain, as far as the quality of the air should be, he has some influence on that.”
 - “The owner again for the quality the type of conditions they want to maintain in the spaces.”
 - “The facility manger for maintenance and for what they are familiar with, service.”
- The type of owner has significant effects on the type of equipment selected.
 - “Equipment selection depends on the type of owner. If they are looking for something that is going to last a long time and give them as little problems as possible, then they'll go toward the better equipment or more expensive equipment. But if it is somebody that's just looking at dollars and how fast they can get this building to pay for itself, then they look at the lower end.”

DESIGN ENGINEERS . . . EQUIPMENT SELECTION . . . KEY INFLUENCERS/DECISION-MAKERS . . . (CONTINUED)

- “Again this is a joint decision. What the owner thinks he has for capital or what he's looking for — short term or long term. We are just the tools of the owner. We try to guide them to the best solutions for their needs.”
- The type of equipment selected is often tied to the size of the project.”
- “Retrofit stuff is usually smaller equipment. We wind up taking some old rooftop unit off and putting a new rooftop unit on. It's usually smaller sized equipment.”
- “Again it is similar to the size of the project. Smaller projects, their owners are less likely to want a specific manufacturer. When you get to the bigger project owners they are going to want to specify something that they probably already have, mainly for maintenance. They have one manufacturer already and they don't want to start stocking parts for another manufacturer.”
- “The larger customers tend to have a facility manager that has some knowledge of HVAC systems and equipment so they tend to have a little more influence. The smaller facilities and the schools and churches, they may tend to have less influence because they are just less informed.”
- Even if a higher efficiency unit is specified, there are times, usually when projects are over their construction budgets, that “they need to value engineer the design to get it within what the owner can afford. And that usually tends to reduce it to a different type of equipment, possible system design change too. There are two ways this happens — we have a contractor on the project team from the start and the budget problems get surfaced quite early and we are able to rectify them and get systems designed within the budget. If the contractor is not on board early, then the other way it happens is when the project goes out to bid and the bids come in over budget. A lot of times there are clauses where we have to go and redesign the system at no additional expense to the owner. That's not uncommon. It happens.”
- Designers also feel they may have “a little less influence on remodeling projects because you have existing equipment that you are trying to maintain compatibility with.”

DESIGN ENGINEERS . . . HVAC EQUIPMENT SELECTION . . . PREFERRED EQUIPMENT CHARACTERISTICS

WHILE RELIABILITY IS TOP OF MIND FOR ALL OF THE DESIGNERS, HALF OF THE DESIGNERS INTERVIEWED MENTIONED EFFICIENCY WHEN ASKED: "WHAT EQUIPMENT CHARACTERISTICS DO YOU CONSIDER MOST IMPORTANT WHEN SPECIFYING HVAC EQUIPMENT".

- Designers reported that reliability was the attribute clients most often request in HVAC system design (7 designers), followed by first cost (3), efficiency (2) and comfort (1).
 - As one designer said: “Our clients want to be assured that their system is going to meet their needs and it's not going to be troublesome for them. They want something simple, clean, and neat that they can operate and maintain. Something that’s not going to cost them an arm and a leg to own, operate or maintain. They want to know that they will be able to live with the system once it is installed.”
 - In summary, “Reliability is always the key, if you can find something that has real good efficiency and is reliable you have what you are looking for.”
- Designers prefer to specify reliable (not state-of-the-art) (4) equipment that is energy efficient if possible (3). Two also mentioned they use gas over electric whenever possible, because of lower operating costs.
 - “We aren't necessarily interested in dealing with the state of the art, the reason being a lot of times it is somewhat experimental and the last thing my clients want is for me to be using them as a guinea pig. So we use tried and proven technology and methods of system design and equipment selection. We use products we know work and don't have a history of problems.
 - “Typically we are not specifying what I would call state of the art, the brand new absolute most efficient thing on the block. We try to stay away from that stuff just because it doesn't have a good history behind it. And likewise we stay away from the cheapest equipment that is out there. So I guess it is good reliable equipment that is near the top of the energy efficiency standards but really isn't state of the art super efficient stuff.

DESIGN ENGINEERS . . . HVAC EQUIPMENT SELECTION . . . PREFERRED EQUIPMENT CHARACTERISTICS . . . (CONTINUED)

- When asked how energy efficiency fits into the equipment selection process, half of the designers said energy efficiency is taken into account in their designs, half said it is used whenever the budget allows, and one designer, an energy conservation expert, noted that energy efficiency "is our business".
 - “Energy efficiency is always on our mind, but with most of my clients it is not paramount. It is not the highest priority. Again the highest priority is that they want it to work. They don't to have to be fiddling with it and fussing with it after they move in to get it to work for them.
 - “I am real big on trying to keep things as efficient as we reasonably can within the budgetary scope and all that. So as I am designing I work to keep things as energy efficient as I can.”
- Equipment specifications vary by the size of the job and the type of facility.
 - “If you are dealing with a client that has a chiller system, it is going to be a more educated client and they're buying the chiller for high efficiency. If you are talking about rooftop units, there might be some cutting back to go to a less efficient rooftop unit to save funds — which is more on the smaller projects, smaller clients.
 - “The industrial market where somebody is putting in a process line and they may only be doing it for 2 years - they are not interested in long term payback. Let's say they are making a new diaper and they have a pilot plant to build. They are going to run it for 2 years to see if it is possible or not and they don't have any goals beyond that point. It may be there 40 years or it may close up in a year.
 - “It varies with different situations, yes. But whether it's retrofit or remodel is not necessarily the criteria. It's how critical the function of the HVAC system is in the application.”

DESIGN ENGINEERS . . . HVAC EQUIPMENT SELECTION . . . PREFERRED EQUIPMENT CHARACTERISTICS . . . (CONTINUED)

- Another designer provided a good summary of some of the differences between equipment selection in retrofit, renovation and new construction jobs. “In retrofit jobs (equipment selection) is not that important because the equipment you are specifying typically is no different from one manufacturer to the next is no different. They have subtle differences, but they are all pretty much reliable. When you get into an air handling unit or a chiller or a boiler, and those are done more in the newer projects, I have to design a heating and cooling plan for that new building. Usually a remodeling project already has a heating plan on site and we are just modifying the ductwork and piping and so forth to accommodate the new floor plan. But in new construction we are building a new power plant, adding a new boiler and chillers where there is a wide range of quality and in that type of equipment there is a wide range of quality between manufacturers and types of boilers and chillers.”

DESIGN ENGINEERS . . . ROLE OF ENERGY EFFICIENCY . . . PROMOTION

HVAC DESIGNERS ARE MORE OPTIMISTIC ABOUT AND SUPPORTIVE OF ENERGY EFFICIENCY THAN DISTRIBUTORS AND CONTRACTORS. THEY CAUTION, HOWEVER, THAT RELIABILITY IS PARAMOUNT.

- While 4 designers say that their clients “specifically request that you specify high efficiency” 50 percent of the time, three others say that very few clients (less than 10 percent) request energy efficient specs, and one other estimates that 25 percent of their clients specify energy efficiency. The other 2 designers said “most” of their clients “would like” energy efficient HVAC systems.
- Seven of the designers “almost always” specify HVAC equipment that is more efficient than code, with the other 3 specifying above-code equipment more than half the time.
- Again, the major drawback (other than cost) to specifying energy efficient equipment is the concern about the systems working properly (5 designers). One designer noted that specifying energy efficient design sometimes causes clients to have overly optimistic expectations about bill savings, comfort and quality, sometimes resulting in dissatisfied clients.
- Two designers cited situations where installing energy efficient HVAC equipment can actually lower the cost of the HVAC system.
 - “A college recently had to do a boiler replacement on a building that was built in the late 1950's. I put in these real high efficiency boilers and at the same time was able to upgrade their controls in the dorm rooms and chapel, and final construction cost was less than what a couple of contractors proposed to just replace the old boilers. And they are just tickled pink.
 - “When you put condensing furnaces in you no longer need to have a fire-rated room so you are saving money on the construction of the building.”

DESIGN ENGINEERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . END USERS

DESIGNER SOLUTIONS TO END-USER OBSTACLES WERE VARIED, BUT CONCENTRATED ON JUSTIFYING ENERGY SAVINGS WITH DEMONSTRATED RESULTS (4 DESIGNERS) AND FINANCIAL INCENTIVES (3 DESIGNERS), INCLUDING REBATES AND FINANCING.

First cost was the primary obstacle mentioned by 8 of the 10 design engineers interviewed, with reliability and lack of familiarity with the latest technologies also mentioned.

- “Probably the most effective solution is demonstrating the payback to the owner. Sometimes that gets a little complicated and we are not paid to show the owner that.
- “I think if the energy efficient equipment is in the marketplace over time and gradually shows that it is reliable people will start to gravitate towards that equipment and purchase that equipment, and typically you would see prices go down. So I would think that it really is just a matter of time. The market kind of gets transformed when the energy efficient equipment is shown to be reliable and people start buying it and as people start buying it the price comes down and pretty soon everybody is buying it.
- “The one way that I've seen that has helped is a grant program. I've seen a lot of cases where local utility gives rebates for higher efficiency equipment in the form of financing. That really has helped a number of owners with their projects when they're tight for money – if they can guarantee discounts off their utility bills down the road or some type of financing, that tends to push them into going for the higher efficiency equipment.”

DESIGN ENGINEERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . OBSTACLES

WHILE 2 DESIGNERS DID NOT SEE ANY OBSTACLES TO "DESIGN ENGINEERS' WILLINGNESS OR ABILITY TO SPECIFY AND PROMOTE ENERGY EFFICIENT PROCESSES AND EQUIPMENT", 4 NOTED THAT THE PROJECT AND/OR DESIGN BUDGET PRECLUDES ENERGY EFFICIENT SOLUTIONS. TWO OTHERS SAID THAT DESIGNERS ARE COMFORTABLE WITH THEIR EXISTING METHODS AND HAVE LITTLE CONFIDENCE IN THE NEWEST EQUIPMENT.

- “Usually design engineers are given a budget that they have to meet and energy efficient equipment doesn't usually fit into the budget.”
- “The biggest obstacle is that most design companies are working on a shoestring for income and they have to crank designs out the door and they use a cookie cutter for every job and do not spend the time to properly engineer each job.”
- “Many designers like to follow the design methodologies they are comfortable with and don't want to make radical changes, risking the performance of the systems.”
- “The biggest problem is a lack of confidence in new equipment; possible problems with new equipment. For example, say you have a new boiler design and it looks good, the reps will always tell you that there are 200 units that have been working on the East Coast for 10 years with no problems. This is a very common sales tactic. Then we find out after we put in some of these boilers that they are having trouble getting them set up and running reliably. Usually you don't find out until the middle of January that your boiler is not going to run correctly. In the middle of winter it becomes a huge problem for the owner. So the specifying engineers tend to stay away from new products for several years.”

DESIGN ENGINEERS . . . OBSTACLES TO EE PURCHASES AND POSSIBLE SOLUTIONS . . . SUPPLIERS . . . SOLUTIONS

EDUCATING THE OWNER ON THE BENEFITS OF ENERGY EFFICIENT SYSTEMS, THROUGH DEMONSTRATING SAVINGS AND THE TESTIMONIALS OF SATISFIED CUSTOMERS, ARE THE BEST SOLUTIONS TO THE OBSTACLES FACING DESIGNERS.

- “I guess the only way is to sit down with the owners and explain to them one on one, take all the time it needs, but sometimes we don’t have the time it takes.
- “The most effective way is to make a list of satisfied customers in the region that the prospective owner may be familiar with that can report their experiences with the equipment and whether or not they would purchase it again.”

DESIGN ENGINEERS . . . FOCUS ON ENERGY SERVICES

DESIGN ENGINEERS (IN ADDITION TO THE REBATE/DESIGN INCENTIVE PROGRAMS) WANT ARE BETTER COMMUNICATION BETWEEN FOCUS AND THE DESIGN ENGINEERS AND REDIRECTION OF ADVERTISING BUDGETS INTO FINANCIAL INCENTIVES.

- The designers are the most familiar with, and active in, Focus on Energy programs. All but one of the designers was familiar with Focus, six have completed jobs with Focus support, and another is “on the verge” of working on a design with Focus assistance. With the exception of one designer who specializes in schools, however, participation to date has been minimal. Reasons offered include the following.
 - “We are trying to get projects sold that way, but right now we are having troubles getting owners to spend the money to do technical studies.
 - “The studies that are being done now are very helpful to the owners. This is primarily institutional, for schools that we been involved in. But they are generally disappointed that they do not get as much help as they expect in the implementation part of the project.”
- Solutions to the obstacles confronting design engineers (in addition to continuing the rebate/design incentive programs) are better communication between Focus and the design engineers (3 designers), and redirection of advertising budgets into financial incentives (3 designers).
 - “If they would actually call us consulting engineers directly and not have the programs cost an arm and a leg and take all day long to find out what they plan on doing. I'd like their field reps to get out and contact us one-on-one — phone, e-mail it doesn't matter.
 - “They could probably do a little better job promoting their programs. We don't always know all of the programs that are out there. I guess it's some of our responsibility to contact them and find out, but it is also if there is an easy way for them to get the information out, distribute it, that makes it more out in the public domain. Develop a web site that we can look at; maybe they do have one, I don't know.

DESIGN ENGINEERS . . . FOCUS ON ENERGY SERVICES . . . (CONTINUED)

- “I guess that the one observation that I have had and I know I've talked about with other people is that it seems like most of the money for FOE really isn't going directly to promoting energy efficiency. It is going to pay people's salaries that are just kind of running around and talking about energy efficiency. This is just my opinion, but I think there could be more effective ways of using those dollars to get them directly to the customer. They spend a lot of money on advertising and I think a lot of that could just be put directly towards financial incentives for energy efficient equipment.”

- “They need to become more specific in what their objective is and what they are expecting the owners to do. I think that they advertise too much; it is beyond what is necessary. When I see an ad for FOE every half-hour day in and day out on TV I think it's way too much. The message is there, people are familiar with the name. They need to put more money into implementation now – more money into project implementation to help the owners build some of the stuff that they want them to build. They have some pretty good technical people I am surprised to say. Usually these kinds of programs start out and they are weak that way but in our area at least the technical people are really strong, they are really good.”